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VIRTUAL REALITY HYPERMARKET (VR HYPERMART)

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ABSTRACT

Virtual Reality Hypermarket is an idea to generate a virtual reality version of a hypermarket, complete with shelves, products, product database record, searching function and the show way function. Virtual Reality Hypermarket is an online operation and navigation in the three dimensional malls and stores. Beside that, it provides the searching, add, delete and edit the database record of the hypermarket stock.

In the main page, the client can decide whether want to go to VR shopping or go for the main page of the website. For the VR shopping, the clients are touring in the VR environment where design was full with shelves, product in the proper placement and cashier. From here, the client was able to view the database record of product detail and product amount in the VR environment. Beside that, the client able to change the view point to the desired view point of each department.

For home page section, there got show way function to let the customer just know the way to go for selected department they desired. Here got two functions in show way which is VR and flash. Other than that, another searching function which can had searching of the product availability and showing the product detail. Another function is the administrator back office. Here the admin need to login to had additional function working like add, remove and delete the stock of database record. This system was connected with the database of storing in hypermarket to make sure the

information of storing in the database is always updated and implementing through online access to the database.

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CHAPTER 1: THE PROBLEM

1.1 Introduction

Buying and selling the goods and services over the internet is called electronic commerce [1]. With the increase of electronic commerce, the developing of virtual reality stores and shopping malls seems had more potential value. Virtual Reality Commerce is an online operation and navigation in three dimensional malls and stores. It enables continuous navigation between separately design and managed stores and incremental loading of spaces and objects needed. Beside that, Virtual Reality Commerce offers simplified navigation with less decision making via a two-dimensional 'mall directory map'. In this project, the Virtual Reality Commerce decided is a hypermarket environment.

Virtual Reality Hypermarket is a virtual environment hypermarket which is in three-dimensional environment with the detail information and location of the product. When the client decided to view the product location, an animation of 2-dimension flash will showing to the client the way to reach the product required. The price, brand and stock remain will be mention in the system interface. The client also can tour the whole hypermarket freely by their own control using the frame and device provided. This provides an interactive way between the computer and user to browse the virtual reality environment hypermarket.

This system is 1-tier architecture layer which involve the client layer and server layer. The client end and the server end can be linked together by Internet at any place. The host sever includes the database server. This system was connected with the database of storing in hypermarket to make sure the information of storing in the database is always updated. Once the goods had sold out, the number of the goods will be deducted. For administrator login to add new or update product information, this can be implementing through online access to the database.

1.2 Background of the Problem

The government will freeze the opening of new hypermarkets in the Klang Valley, Johor Bahru and Penang for five years [2]. This decision, which was made by the Cabinet, was based on the fact that the number of hypermarkets in these areas had exceeded demand. The government was aware of the growing trend among local consumers to shop at hypermarkets because of their competitive prices. In addition, the growth of hypermarkets, if left unchecked, would jeopardize the livelihood of small-scale traders in those areas. The government said there were now 38 hypermarkets throughout Malaysia and most of them were located in the Klang Valley, Johor Bahru and Penang. For example, in the Klang, there are 18 hypermarkets and this is more than enough as there are less than five million people in that area.

1.3 Statement of the Problem

Data in above section had come out that there are 18 hypermarkets in Klang Valley. The residential in Klang Valley had many choices to determine which hypermarket they want to go. The most effective factor to attract the consumer to patronage the hypermarket is the lower prices offer.

Nowadays, most of the hypermarket keep distribute the leaflet about the offer price to the residential in order to attract more consumer. Beside that, the offering of super special prices at certain moment and also lucky draw are new tactic to attract the consumer. The management of hypermarket was using every possibility to get more consumers in order to survive in this fury competition between the hypermarkets.

1.4 Purpose of the Study

In order to maintain the sales of product in hypermarket, this research had suggested a new method to attract more customers especially to the customer who had online. This method was built up a virtual reality hypermarket. This services can be access in anytime at anywhere through online. This service also can set up at the entrance or any corner inside the hypermarket. This service provides a virtual architecture of the hypermarket and also a 2-dimension flash map to the client to browse through in the hypermarket. This meets the trend of the flow of technology in this era. It attracts younger people attention and also let the older people to contact with the technology equipment.

1.5 Objective of the Study

- Visualize hypermarket architecture to three-dimensional graphical environment using VRML computer language.
- A virtual directory for hypermarket client.
- Have a pre-concept of hypermarket before the client of hypermarket enters the hypermarket.
- The ability to display more detail information in the three-dimensional virtual world.
- Navigable of the structure and architectural of hypermarket.
- Provide interactive and reactive environment to hypermarket client. (Input- keyboard & mouse, output- speaker & screen monitor).
- Provide multi-sensory environment with audio and visualization to the hypermarket client.
- Provide stock checking ability in the database.
- Provide back office for administrator login to stock checking and editing the stock arrangement.

1.6 Statement of Hypotheses

The virtual reality hypermarket which function as a virtual directory of a hypermarket which provides the information about the hypermarket department, the category of goods, the item brands and price, stock amount and also the location of the stock in the hypermarket which is using online platform. The

location was show in 2-dimension and the user can navigate the virtual environment in 3-dimension. At the same time, the administrator can make stock maintenance in the database through the same online framework.

1.7 Importance of Study

This study can let the hypermarket had a unique feature in order to meet the hard competitive among the hypermarket. It can let the consumer to have planning before they go for shopping at the hypermarket. It also save the consumer time when they are in the hypermarket in searching the product they want. Consumer can compare the price of the product through online. It also provides the transparency of the data storage inside the hypermarket.

1.8 Definition of Terms

1.8.1 The definition of hypermarket:

Hypermarket (from the French hypermarch) [3] is a store which combines a supermarket and a department store in commerce. As a result, a gigantic retail facility which had enormous category of product in a place includes fresh groceries and attire.

Example of hypermarkets in Malaysia:

- Carrefour
- Fairmart
- Makro

- Giant
- Tesco Store
- Jaya Jusco
- Xtra

1.8.2 Definition of virtual reality:

Virtual reality (abbreviated VR) [4] describes a three-dimensional environment that is simulated by a computer which comes out with special visual experience display in the screen of computer or through special stereoscopic goggles. Others additional sensory is the speaker which the sound come out from there.

The user can interact with the VR environment through the computer device like keyboard or mouse, or through specially designed devices like a cyber glove. The simulated environment which is similar to the real world

1.9 Scope of the Study

- Expose and introduce the environment and product of hypermarket in detail to client of hypermarket.
- Guiding transportation in hypermarket.
- Standard desktop pc with standard monitor.
- Interface with keyboard, mouse and speaker.

- Information provided (department, category, brand, price, stock amount, location).
- On one frame work interface, only can let single user to manipulate the tour of the virtual reality environment.
- The database allows multi user access to retrieve the information.
- Administrator can update the information.

CHAPTER 2: REVIEW OF RELATED LITERATURE

2.1 Overview

A literature review [5] surveys scholarly articles, books and other sources (e.g. dissertations, conference proceedings) relevant to a particular issue, area of research, or theory, providing a description, summary, and critical evaluation of each work. The purpose is to offer an overview of significant literature published on a topic. To enhance and find the suitable way to develop the system, doing the literature review is necessary. By doing the literature review, researcher can refer the method, tools and theory in the literature review, in order to investigate new method and new problem solving method or enhance the system which going to develop. In this section, investigate of the existing literature which had correlate with the topic "Virtual Reality Hypermarket" will be implement. The problem formulation, literature search, data evaluation and analysis and interpretation of the literature will be discussed in the following part. In addition, the system of "Virtual Reality Hypermarket" which correlates with the literature which going to be analysis will be mention inside this part.

2.2 Theory and Tools Listing

2.2.1 3dmax

3D Studio MAX [6] has a built-in VRML exporter that translates MAX files into VRML files. Here are the basic steps for creating a VRML file in 3D Studio MAX:

- Create geometry
- Create lights and cameras
- Assign materials and texture maps
- Animate
- Insert VRML helper objects
- Export to VRML
- Use a VRML browser to test the file
- Optionally, use a text editor to edit the file.

3D Studio Max [7] (sometimes called 3ds Max or just MAX) is a 3D computer graphics and animation program, written by Autodesk Media & Entertainment.

Modeling [8] is the basic of virtual navigation system. Here, using the VRML as the modeling language because the VRML [9] (Virtual Reality Modeling Language) is a standard file format for representing 3-dimensional (3D) interactive vector graphics, designed particularly with the World Wide Web in mind. To a desktop virtual reality system, the design of virtual environment is limited by the hardware condition and also the bandwidth of the user access. The model with too much detail will slow down the navigation speed. However, too simple model will not bring good view effects.

2.2.2 Web-based server

The system [10] of web-based should include user interface layer, business logic layer (function layer) and data-visit layer. This is divided into two parts: the server end and the client end. If there is protective firewall between them is better. The client end and the server end can be linked together by Internet at any place and any time. The host server includes the file server, the database server, WWW server, the producer for dynamic web page and 3D object. There is also a functional Computer Gateway Interface (CGI) [11] for general processing. The file server contains pre-made HTML templates, which are for the dynamic pages, along with 3D object files (e.g., VRML files) are for the 3D models.

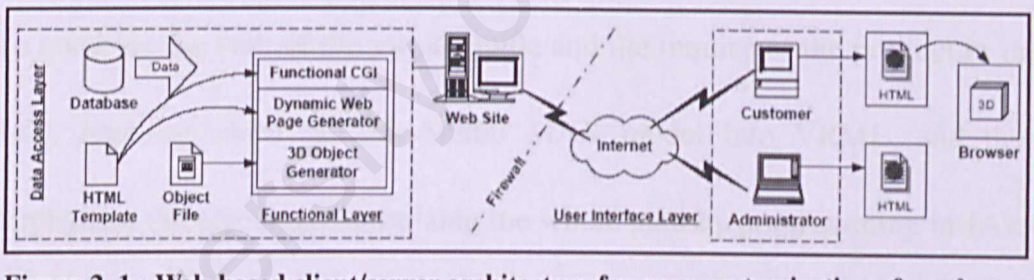


Figure 2. 1 : Web-based client/server architecture for mass customization of product

2.2.3 Virtual Guider

Role cartoon technology [10] use to design the virtual guider: first, the role model is set up as the motive system; then the system will move like alive. The role cartoon is designed with Character Studio 3.X role cartoon system that provides methods of setting up and modifying roles including tools to create group cartoon. Character Studio [12] is a plug-in which makes the animation of characters and crouds easier in 3ds max. Character Studio

provides various unique tool groups for motion-catching, the free cartoon style as well as the step-trace cartoon. Here, using virtual bones to control the points on the limbs and these bones make up the skeleton of the role. The role to put up various poses and adjusting the skeleton. It should be noted that the points on some places often have problems of dragging the skin and the muscle, that is, here may be dragged by other parts of the body or stay at the same place uncontrolled by the skeleton. This is caused by the unreasonable distribution of the weight of the skeleton. To get rid of the phenomenon, we can do by adjusting and controlling the weight of points on the model.

2.2.4 Path-Planning

To combine the path of the virtual guide and the inquiry of the product in the mall, here introduce the 3D Studio MAX model into VRML, and then implement the algorithm optimizing the whole path by programming in JAVA and XML. This algorithm presents the virtual environment using the girding method. The data structure of the octo-tree is used to represent the discrete environment. Every node of the tree represents a cell and includes a table of eight pointers pointing to the other nodes. The null pointer represents a free cell. The 3D environment can be divided into the borderline, the free zone and the blocking zone according to their accessibility. The heuristic overall search algorithm of width priority is applied.

Optimization algorithm of overall path:

1. Mark all borderline cells

2. Use three kinds of heuristic knowledge:

- How to select the cells neighboring the current cell
- How to define the order of the neighbor cell under measurement
- Some additional conditions about those neighbor cell under measurement

3. Get the heuristic function: $r(n) = g(n)+h(n)$, $g(n)$, $h(n)>0$, $g(n)$ represents the cost moving from the beginning to node n, $h(n)$ represents the estimated cost moving from node n to the target node, $r(n)$ represents the total cost

4. Search as follows:

- Search a path from the start to the end using the width priority rule according to the heuristic function and the relevant heuristic knowledge.
- Form a new octo-tree with the node along the above path and the heuristic knowledge
- Get an path-optimized tree by searching the new octo-tree using the Dijkstra algorithm

5. Complete the whole process

2.2.5 VRML

VRML (Virtual Reality Modeling Language), [5] designed for 3D rendering on the web. VRML is a text file format (like HTML) for describing

interactive 3D objects and worlds on the Web. VRML 1.0 was finalized on Nov 95 and described static 3D worlds. VRML 2.0 was published on Aug 96 and added dynamic and scripting capabilities to VRML worlds. The VRML browsers are embedded as Plug-in in the popular Web browsers Netscape's Navigator and Microsoft's Internet Explorer. Having a standard for 3D is very important, but there is a big barrier for real applications and in particular for e-commerce based on VRML.

Analyzing the reasons for the slow and limited adoption of VRML yields the following:

- Performance: VRML files are typically large and processing is non-trivial, which result in substantial delays and high demands. Imagine a virtual 3D mall with many corridors and many stores where each store contains many 3D items. Loading such a world over a 28.8kb modem could take a very long time. Moreover even when loading is finished, a typical consumer machine may not be strong enough to render the whole mall.
- Navigation: Navigation in virtual 3D spaces is hard for the average user, using typical UI mechanisms. Controlling the mouse to maneuver to the desired direction requires a high level of coordination; in addition users just get lost in 3D spaces and can't find the right direction to move.
- Connectivity: The web is based on a collection of pages linked together through hyperlinks, and much of its success comes from the ease of

connecting (linking) pages created and stored independently. VRML does allow definition of links between spaces; however these links result in discarding the existing space and loading a new web page (which may contain another VRML space); this result in a discontinuity and loss of the virtual reality feeling. To achieve continues and smooth transition between separately designed and stored spaces. Having continues navigation between stores in a mall and even between departments of the same store is much more natural and intuitive then jumping in space.

The Virtual Reality Modeling Language (VRML) [13] defines the nodes Anchor, Inline and LOD (Level of Details). Anchor is a hypertext link to another space, which does not support the continuity feature. Inline allows embedding a 3D space in another space; however the spec does not define when Inlines are loaded and some browsers load all the Inlines in advance which can not tolerate very large spaces. In fact, it may be impossible for the browser to properly predict when to load inline objects. Level of details (LOD) is a mechanism to load spaces according to distance of the viewer from them. Like Inline the specification does not specify when LOD nodes are loaded but just when they are displayed, so again some browsers load LODs in advance.

2.3 System Comparing

The system [7] in comparing with the research is a prototype in the literature review with the title "A 3D Virtual Shopping Mall That Has the Intelligent Virtual Purchasing Guider and Cooperative Purchasing Functionalities" by Yiming Zhao, Lijun Guo, Xiaoli Wang, Zhigeng Pan from Department of Computer Science & Technology (NingBo Uinversity, Ningbo) and State Key Laboratory of CAD&CG (Zhejiang University Hangzhou) of china.

This system is a multi-user interactive virtual purchasing environment. In this environment, there is a symbol with mood for every customer, which can communicate freely with symbol of other customers, commodities in the shopping mall and the intelligent agent. In the meantime, a virtual purchasing guider is designed to communicate with different symbols of customers in different manners. This virtual guider is able to patrol in this virtual environment along the path planned by it own. Customers may have dynamic communication with other purchasers through the virtual guider or operate interactively on all kinds of commodities. This system simulates the whole purchasing process including window-shopping, choosing and paying for the items. Such comprehensive simulation is a new makes the customer feels like they are personally on the scene.

The theory and technique of this system had been justified on the above section. The theory using are 3dsmax, virtual guider, path-planning and web server. For

more detail information, please refer to above section. Among the system had been read, this system is the most interactive and reactive system. The function like virtual guider and path-planning allowed the user interactive with the system in real-time. The system also will give the feedback at that time. This is a communication between the system and the user, so the programming part of the system in interactive with the user had write in an advancing language like JAVA. In JAVA language, the algorithm was using to presents the virtual environment by the girding method. The data structure of the octo-tree is used to represent the discrete environment. The theory using in this system was suitable to let us using in the research. In order to create an interactive environment which is user friendly, the virtual guider and path-planning technique is needed.

2.4 Conclusion

Literature review is a crucial part in a system development cycle. A lot of information, ideas and knowledge should be gathered to develop research system through the process of doing the literature review.

In comparing the system, the theory which suitable to this research had been defines. In the following steps, the research will be more detail in handling the theory recommend and try to master the technique to apply in the research topic. By doing this, another advancing Virtual Reality Hypermarket will be invented.

CHAPTER 3: METHODOLOGY OR PROCEDURES

3.1 Tools Overview

3.1.1 PHP

PHP [14] is a popular open-source, reflective programming language used mainly for developing server-side applications and dynamic web content, and more recently, other software. Originally, PHP stood for "Personal Home Page". Today, the official meaning is the recursive acronym "PHP: Hypertext Preprocessor". PHP allows interaction with a large number of relational database management systems, such as MySQL, Oracle, IBM DB2, Microsoft SQL Server, PostgreSQL and SQLite. PHP runs on most major operating systems, including UNIX, Linux, Windows, and Mac OS X, and can interact with many major web servers such as Apache and IIS.

3.1.2 MySQL

MySQL [15] is a multithreaded, multi-user, SQL (Structured Query Language) Database Management System (DBMS) with an estimated six million installations. MySQL AB makes MySQL available as open source software / free software under the GNU General Public License (GPL), but they also sell it under traditional commercial licensing arrangements for cases where the intended use is incompatible with use of the GPL. MySQL works on many different platforms—including

AIX, BSDi, FreeBSD, HP-UX, Linux, Mac OS X, NetBSD, Netware, OpenBSD, OS/2 Warp, QNX, SGI IRIX, Solaris, SunOS, SCO OpenServer, SCO UnixWare, Tru64, Windows 95, Windows 98, Windows NT, Windows 2000, Windows XP and more recent versions of Windows.

3.1.3 Apache

Apache HTTP Server [16] is an open source HTTP web server for Unix-like systems (BSD, Linux, and UNIX systems), Microsoft Windows, Novell Netware and other platforms. Apache features highly configurable error messages, DBMS-based authentication databases, and content negotiation. The Apache HTTP Server is developed and maintained by an open community of developers under the auspices of the Apache Software Foundation.

3.1.4 VRML

VRML [17] (Virtual Reality Modeling Language) is a standard file format for representing 3-dimensional (3D) interactive vector graphics, designed particularly with the World Wide Web in mind. VRML is a text file format where, e.g., vertices and edges for a 3D polygon can be specified along with the surface color, image-mapped textures, shininess, transparency, and so on. Animations, sounds, lighting, and

other aspects of the virtual world can interact with the user or may be triggered by external events such as timers. A special Script Node allows adding program code (e.g., written in Java or JavaScript (ECMAScript)) to a VRML file.

3.1.5 3D Studio Max

3D Studio Max [18] (sometimes called 3ds Max or just MAX) is a 3D computer graphics and animation program, written by Autodesk Media & Entertainment (formerly known as Discreet and Kinetix). 3ds Max is one of the most widely-used 3D animation software. It has strong editing capabilities, ubiquitous plugin architecture and a long heritage on the Microsoft Windows platform. Features available:

- **MAXScript**

  Is a built-in script similar to C++ programming language, which is useful for developing script using 3D Studio Max objects.

- **Character Studio**

  Character studio is an application integrated in 3D Studio Max helping user to create and animate virtual characters.

3.1.6 Room Arranger

Room Arranger [19] is shareware. It is distributed free of charge. Users are free to evaluate Room Arranger for a period of 30 days before users

are required to register the program. User can reconstruct rooms or rearrange things placed in them. User also can move heavy furniture just to everything would fit with no problem, be handy, and have a good impact. This program enables user to simulate everything with no need to draw on a square paper, or to push things there and back repeatedly. After the plan had arrange well, use can export it to web page and the environment will be export as *.wrl file. This file is written on Virtual Reality Modeling Language (VRML). There is two file will be export, one is the library file define with PROTOs and another file is the main file use EXTERNPROTO. This just tells the browser that the bulk of the object definition is in another file. In your main file, you include an EXTERNPROTO definition, and have the full PROTO in the other file.

3.1.7 SwishMax

SwishMax [20] is a most powerful Flash creation tool made by www.swishzone.com. SwishMax features include:

- Effects

  Bundled with over 230 built-in effects. Effects make animations with text, images, graphics and sound simple and quick to produce. All effects can be added to multiple objects at once.

- Scripting

  No coding required! All interactivity can be added through a simple

menu interface. Debugger that simplifies finding and fixing errors in your scripts.

- Drawing Tools

  Advanced set of drawing tools provided including: Line, Pencil, Bezier, Text, Ellipse/Circle, Rectangle/Square and AutoShapes. Complex Shape editing options making it easy to modify your shapes.

- User Interface

  Objects, frames and effects can all be added, modified or deleted directly from the timeline. Managing movies, scenes and sprites made simple.

- Import & Export

  Import SWF movies produced in any other Flash application. Simply import sounds, graphics and text files. SWiSH Max SWF movies can be imported into any other Flash application with ease.

3.1.8 VrmlPad

VrmlPad [21] is a professional editor for VRML programming. Key time-saving features include powerful editorial abilities and visual support for the scene tree and resource operations. Key feature of VrmlPad is:

- Smart AutoComplete

- Dynamic errors detection
- Visual support for the scene tree operations
- Routing map
- Operations on resources
- Ability to preview the VRML scene
- Automation and scripting
- Publishing wizard

3.1.9 Macromedia Dreamweaver

Macromedia Dreamweaver [22] is an HTML editor developed by Macromedia. It was originally targeted at professional web designers and offers an editing system that combines both the productivity of WYSIWYG design with the control of HTML code editing mode. With the advent of version MX, Macromedia incorporated dynamic content creation tools into Dreamweaver. In the spirit of HTML WYSIWYG tools, it allows users to connect to databases (such as mySQL) to filter and display content using scripting technologies such as PHP, ASP, and ASP.net, without any previous programming experience.

3.1.10 Adobe Photoshop

Adobe Photoshop [23] is a graphics editor (with some text and vector graphics capabilities) developed and published by Adobe Systems. It is

the market leader for commercial bitmap image manipulation, and probably the most well-known piece of software produced by Adobe Systems. Photoshop is currently only available for Mac OS and Microsoft Windows; versions up to Photoshop 7 can also be used with other operating systems such as Linux using software such as CrossOver Office. Although primarily designed to edit images for paper-based printing, Photoshop is used increasingly to produce images for the World Wide Web. Recent versions bundle a related application, Adobe ImageReady, to provide a more specialized set of tools for this purpose.

3.2 Tools Justification

3.2.1 PHP, MySql and Apache

PHP has been designed to work with Apache from the beginning [26]. Both ASP and PHP [27] are both software script languages that can be used to generate dynamic web pages. ASP can be used on a Windows-based server whereas PHP is supported through Unix or Linux servers. They are both free and have tutorials available online, however PHP seems to have more extensive tutorials and free tools. Most web hosting comes with free PHP support, but you need to make sure if you are using ASP that ASP scripts will work with your hosting server. ASP does take more memory so it is slower in loading and is less efficient

than PHP. PHP also can do everything that ASP can do. PHP [14] is use to developing server-side application and dynamic web content. PHP open source and free download. It's easy for the beginner to learn from internet and the open source provided in the web. This server-side language [24] means that the script is run on your web server, not on the user's browser, so you do not need to worry about compatibility issues. This means that, although your users will not need to install new software, you web host will need to have PHP set up on your server.

PHP and MySQL [25] are the world's best combination for creating data-driven sites according to some of the professionals. PHP, MySQL and Apache server is the best combination for server side programming. Software tools of PHP, MySQL and Apache server are available in the World Wide Web for free, consisting of these three components together.

3.2.2 VRML

VRML [17] (Virtual Reality Modeling Language) is a standard file format for representing 3-dimensional (3D) interactive vector graphics, designed particularly with the World Wide Web.

X3D [28] is the ISO standard for real time 3D graphics, the successor to Virtual Reality Modelling Language (VRML). X3D features extensions to VRML (e.g. Humanoid Animation, Nurbs, GeoVRML etc.), the

ability to encode the scene using an XML syntax as well as the Open Inventor-like syntax of VRML97, and enhanced application programmer interfaces (APIs).

A standard [29] is needed to make it possible to create content compatible with multiple viewers. Virtual Reality Modeling Language (VRML) was supposed to be that standard. VRML has been blessed by the ISO. It has been used in education and entertainment, and for visualization in medicine, engineering, and other scientific applications - chemists use VR to visualize complex interactions.

VRML has wide support in programming tools. For instance, professional animators create content using the popular high-end 3D animation program, 3D Studio MAX from Kinetix, and then use the built-in VRML export function to create the VRML file.

3.2.3 3D Studio Max

3D Studio MAX [15] has a built-in VRML exporter that translates MAX files into VRML files. Other features available:

- MAXScript

  Is a built-in script similar to C++ programming language, which is useful for developing script using 3D Studio Max objects.

- Character Studio

Character studio is an application integrated in 3D Studio Max helping user to create and animate virtual characters.

3.2.4 Other Tools

RoomArranger, SwishMax, VrmlPad, Macromedia Dreamweaver and Adobe Photoshop were choosing in developing the system because the researcher was familiar with the tools and able to use the tools to get the result wanted. All this tools is not giving huge effect to the system architecture if comparing using other tools. The tools listed above such as Macromedia Dreamweaver and Adobe Photoshop were the most popular tools in photo editing and HTML editor. VrmlPad is the most popular vrml coding editor tools with the feature available had fulfills the basic requirements of editor tools.

3.3 Data Collection

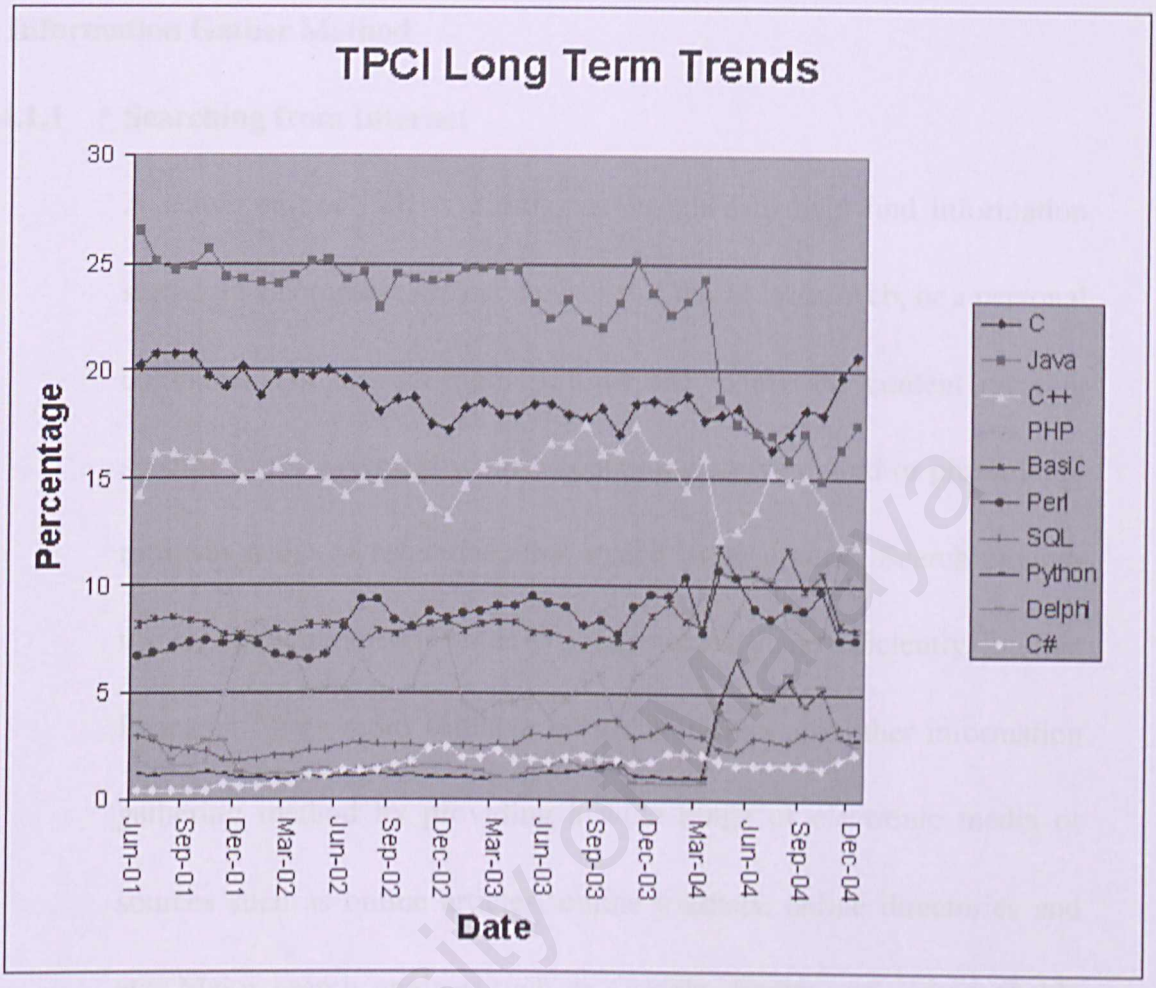


Figure 3. 1 : Popularity of programming language [17]

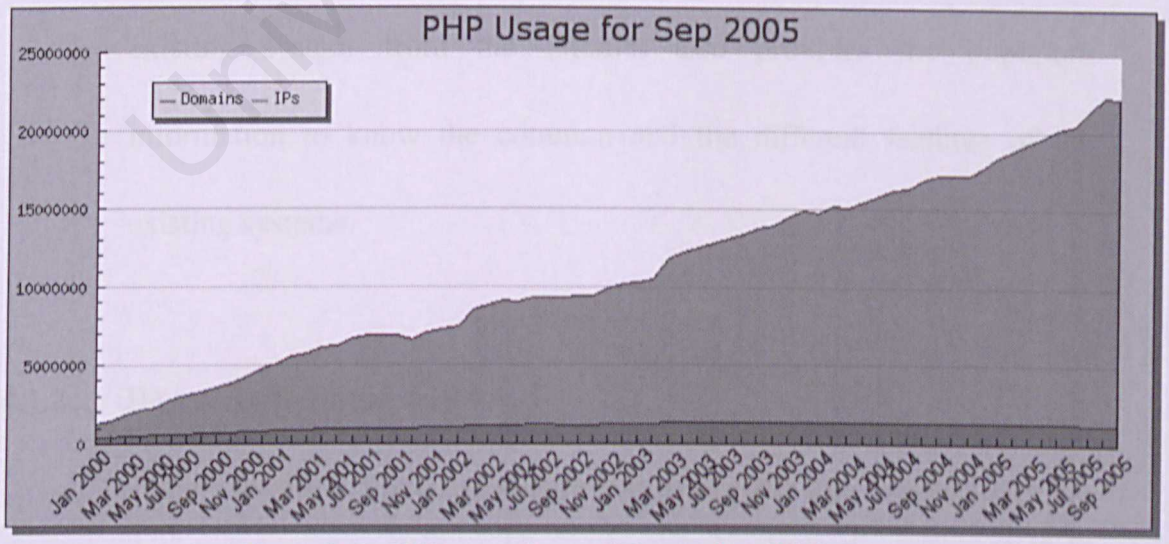


Figure 3. 2 : PHP usage for until September 2005 [18]

CHAPTER 4: FINDINGS (ANALYSIS AND EVALUATION)

4.1 Information Gather Method

4.1.1 Searching from Internet

A search engine [32] is a program designed to help find information stored on a computer system such as the World Wide Web, or a personal computer. The search engine allows one to ask for content meeting specific criteria (typically those containing a given word or phrase) and retrieves a list of references that match those criteria. Search engines use regularly updated indexes to operate quickly and efficiently. Internet Research offers more valuable information than any other information gathering method by providing a wide range of electronic media or sources such as online articles, online journals, online directories and etc. Major search engines such as Google, Excite and Yahoo enable relevant information sites to be viewed easily. The review of the existing system from the internet also provides the important information to know the common and the different features of the existing systems.

4.1.2 Discuss with Supervisor

Discussion about the research title had been made every week to let the progress of the research can run smoothly. Further detail, idea and problem solving method of the research title had gained from discussion.

In addition, the supervisor also shares the valuable knowledge, guidance and support in order to improve the research progress.

4.1.3 Discuss with Friends

With an informal conversation with group member and other friend in doing the related topic, this had got some valuable opinion on other perspective. Beside that, we also had gathering in sharing and teaching each other the tools we had found.

4.2 Functional Requirements

Virtual Reality Hypermarket is a virtual environment hypermarket which is in three-dimensional environment with the detail information and location of the product. For the client interface, the client needs to enter any keyword in order to search the product. The result of price, brand and stock remain will be mention in the system interface. When the client decided to view the product location, an animation of 2-dimension flash will showing to the client the way to reach the product required. The client also can tour the whole hypermarket freely by their own control using the frame and device provided. This provides an interactive way between the computer and user to browse the virtual reality environment hypermarket.

For administrator part, the administrator need to login. After login, they are able to add, delete and update the record of the store.

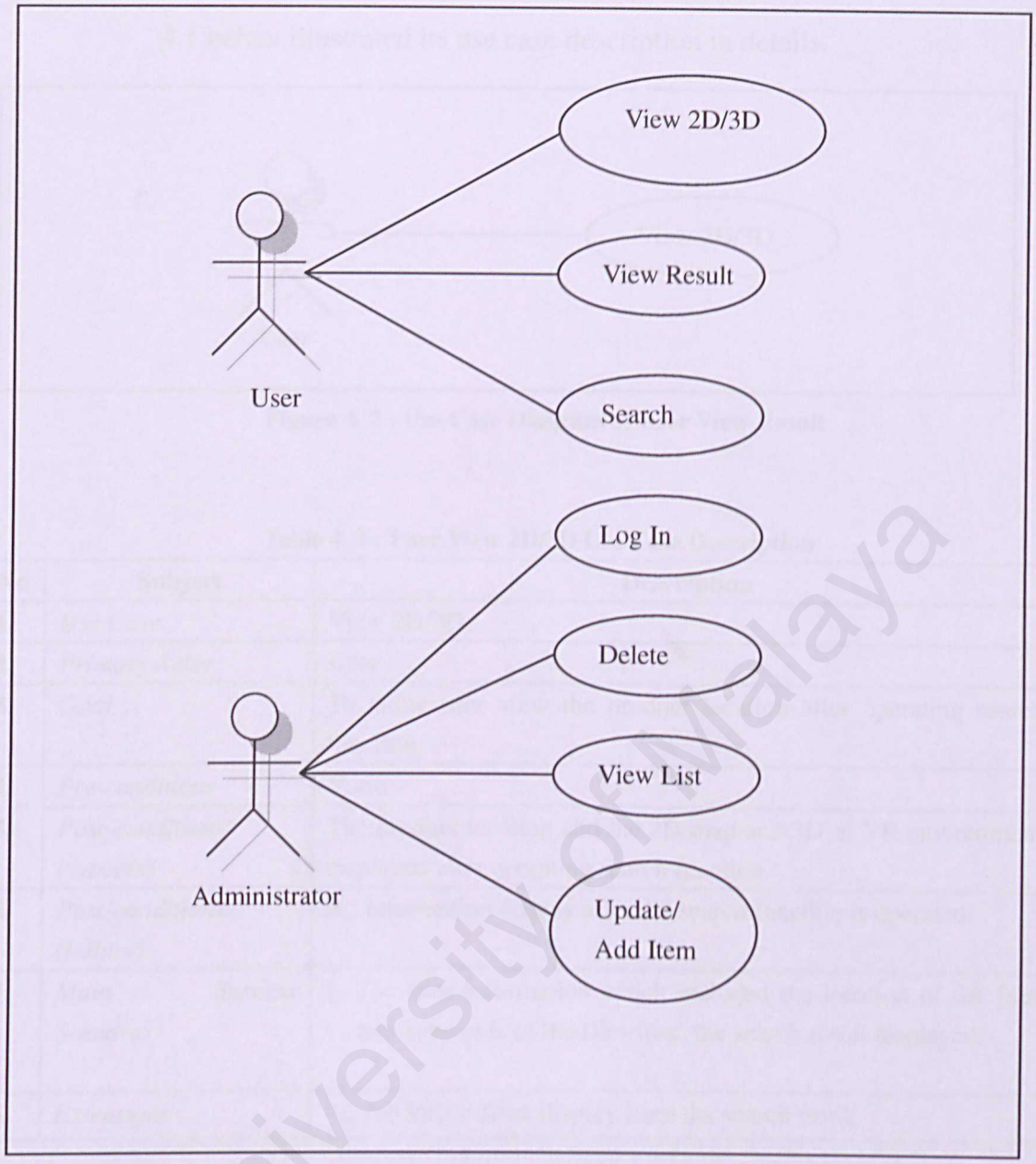


Figure 4. 1 : Use Case Diagram of VR Hypermarket

4.2.1 User View 2D/3D

This system should be able to provide view in 2D and 3D environment function for user to view the product location information after operates the search function. The location information which will be display is the 2D map and 3D environment lead user to the specify location. Figure 4.2 show the use case diagram of view result function and Table

4.1 below illustrated its use case description in details.

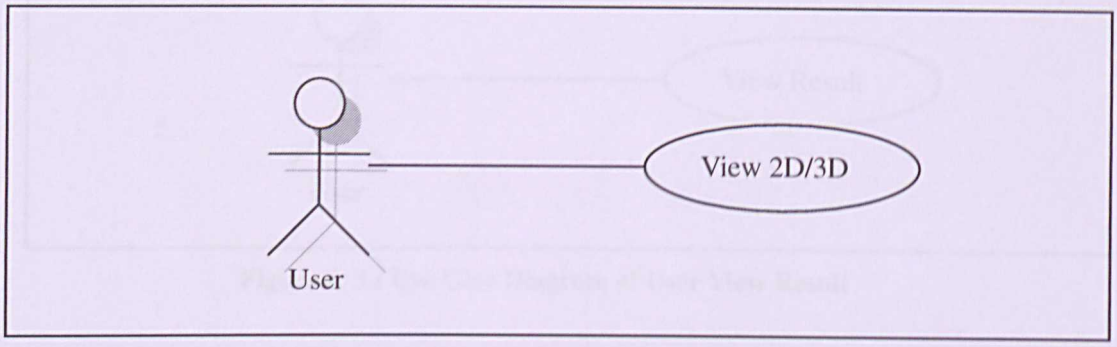


Figure 4. 2 : Use Case Diagram of User View Result

Table 4. 1 : User View 2D/3D Use Case Description

No	Subject	Description
1.	*Use Case*	View 2D/3D
2.	*Primary Actor*	User
3.	*Goal*	To allow user view the product location after operating search function.
4.	*Pre-conditions*	None
5.	*Post-conditions (success)*	The product location and the 2D map and 3D of VR environment displayed after operating search function.
6.	*Post-conditions (failure)*	No information display after the search function is operated.
7.	*Main Success Scenario*	1. The files information which included the location of the files and keywords of the files from the search result displayed.
8.	*Extensions*	1a. No information display from the search result.

4.2.2 User View Result

This system should be able to provide view result function for user to view the files information after operate the search function. The file information which will be display is the location of the files and keywords of the files. Figure 4.3 show the use case diagram of view result function and Table 4.2 below illustrated its use case description in details.

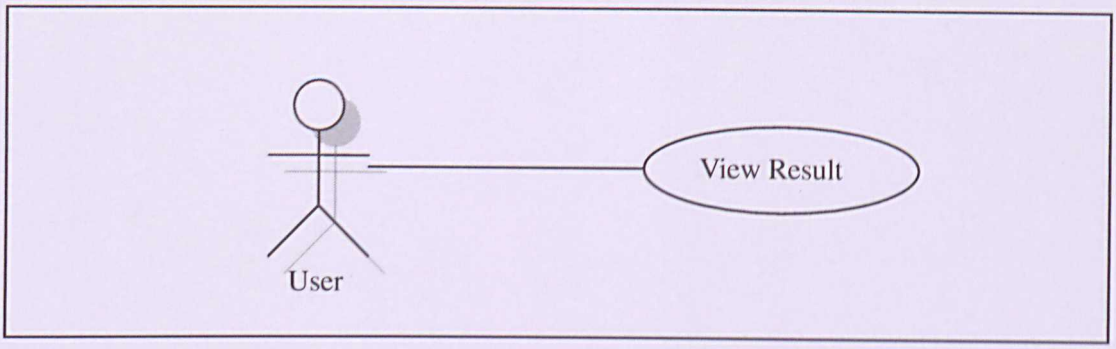


Figure 4. 3 : Use Case Diagram of User View Result

Table 4. 2 : User View Result Use Case Description

No	Subject	Description
1.	*Use Case*	View Result
2.	*Primary Actor*	User
3.	*Goal*	To allow user view the information of the files related with the keywords entered after operating search function.
4.	*Pre-conditions*	The user is a registered or non-registered user for this system
5.	*Post-conditions (success)*	The files information and the percentage of VR application displayed after operating search function.
6.	*Post-conditions (failure)*	No information display after the search function is operated.
7.	*Main Success Scenario*	1. The files information which included the location of the files and keywords of the files from the search result displayed.
8.	*Extensions*	1a. No information display from the search result.

4.2.3 User Search

This system should be able to provide search file function for user to search the files which are needed in the database. User can search the files based on the keywords of the files they needed. Figure 4.4 show the use case diagram of search function and Table 4.3 below illustrated its use case description in details.

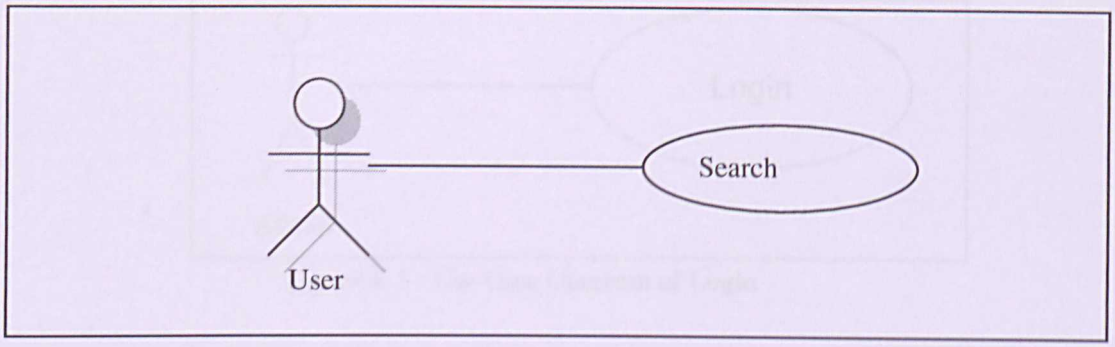


Figure 4. 4 : Use Case Diagram of User Search

Table 4. 3 User Search Files Use Case Description

No	Subject	Description
1.	*Use Case*	Search
2.	*Primary Actor*	User
3.	*Goal*	To allow user search files which stored in the database
4.	*Pre-conditions*	The user is a registered or non-registered user for this system
5.	*Post-conditions (success)*	Related file information will be returned to the user.
6.	*Post-conditions (failure)*	No file information is returned to the user.
7.	*Main Success Scenario*	1. User search the specify file by using file properties - keywords. 2. All of the files, either partially match or fully match will be returned to the user.
8.	*Extensions*	2a. No file will be returned if no match in database.

4.2.4 Administrator Login

This system should be able to provide login function for admin to login to the system. Figure 7 show the use case diagram of login function and Table 6 below illustrated its use case description in details.

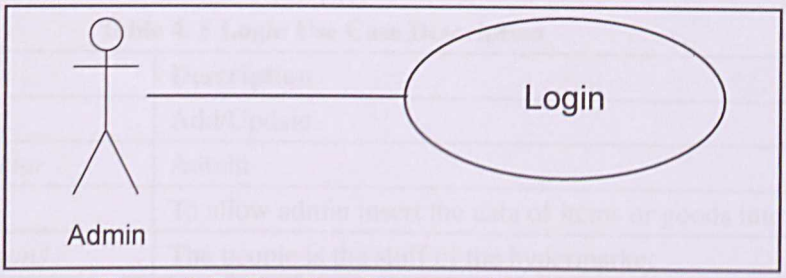


Figure 4. 5 : Use Case Diagram of Login

Table 4. 4 : Login Use Case Description

No	Subject	Description
1.	*Use Case*	Login
2.	*Primary Actor*	Admin
3.	*Goal*	To allow admin to login to the system.
4.	*Pre-conditions*	The people is the stuff of the hypermarket
5.	*Post-conditions (success)*	An admin is login to the system successfully.
6.	*Post-conditions (failure)*	An admin cannot login to the system.
7.	*Main Success Scenario*	The admin enter their username and password correctly.
8.	*Extensions*	The system will not proceed to other pages if the admin unable to input the correct username and password

4.2.5 Administrator Add/Update

This system should be able to provide add/update function for admin to insert the data of items or goods into the database. Figure 8 shows the use case diagram of add/update function and Table 7 below illustrated its use case description in details.

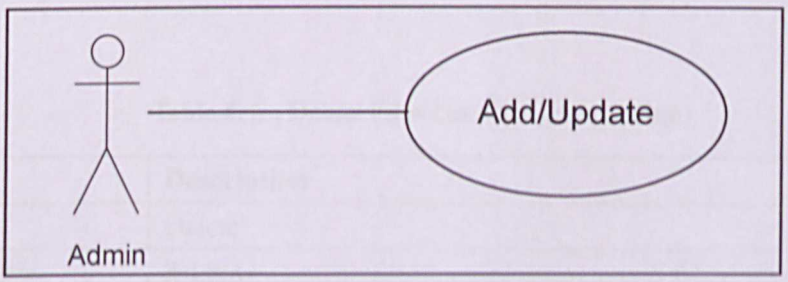


Figure 4. 6 Use Case Diagram of Add/Update

Table 4. 5 Login Use Case Description

No	Subject	Description
1.	*Use Case*	Add/Update
2.	*Primary Actor*	Admin
3.	*Goal*	To allow admin insert the data of items or goods into the database
4.	*Pre-conditions*	The people is the stuff of the hypermarket
5.	*Post-conditions (success)*	An admin is adding /updating the data successfully
6.	*Post-conditions (failure)*	An admin cannot add /update the data
7.	*Main Success Scenario*	The admin enter their username and password correctly in the login page.
8.	*Extensions*	The information entered by admin cannot be captured by the system.

4.2.6 Administrator Delete

This system should be able to provide delete function for the admin to delete the data. Figure 9 show the use case diagram of delete files function and Table 8 below illustrated its use case description in details.

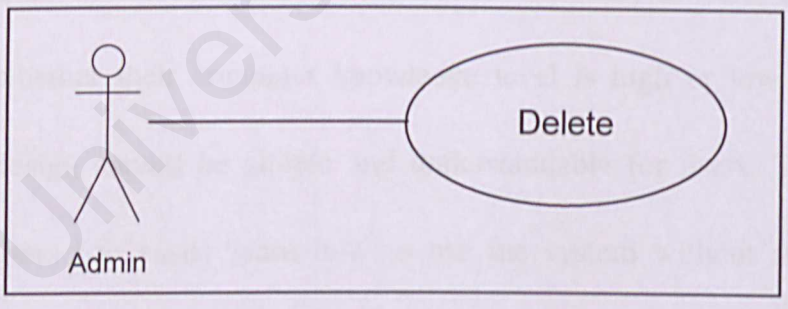


Figure 4. 7 : Use Case Diagram of Delete

Table 4. 6 : Delete Files Use Case Description

No	Subject	Description
1.	*Use Case*	Delete
2.	*Primary Actor*	Admin
3.	*Goal*	To allow admin to delete data.
4.	*Pre-conditions*	The people is the stuff of the hypermarket
5.	*Post-conditions*	The data which is saved in the database are deleted successfully.

	(success)	
6.	*Post-conditions (failure)*	The data which is saved in the database cannot be deleted.
7.	*Main Success Scenario*	Admin activates the delete function.
8.	*Extensions*	The file which is chosen to delete cannot be deleted

4.3 Non-functional Requirements

Non–functional requirement are the constraints and restrictions under which the system must operate and the standards which must met by the delivered system. It describes a restriction on the system that limits one choice for constructing a solution to the problem. Following are some of the non-functional requirement of the Virtual Reality Application for Hypermarket:

4.3.1 Usability

This system should be easy-to-use and easy-to-learn for all users whether their computer knowledge level is high or low. The system design should be simple and understandable for users. Therefore the users can easily learn how to use the system without attending any training and the using of such system will not cause pressure to user such as ease of memorizing the steps taken to perform any facility and the web pages navigation.

4.3.2 Performance

The system should be able to respond fast and accurately after receiving users' request. The search result with the percentage of plagiarism should be showed with accurately within 10 seconds after receiving the request from user. The upload file process should be able done within 10 seconds.

4.3.3 Reliability

The system should be available all the time. The system failure should be able to be fixed within a day and the failure should not affect to other functions in the system such as the failure in upload file function should not affect the search function. The system must also be stable where it must not be easily crashed.

4.3.4 Portability

The system should be able to access by all the users at any time and any place by using a personal computer or laptop with internet access and there is Internet browser installed in the machine.

4.3.5 Maintainability

The system maintenance will required more efforts if the system is not designed according to good programming practices. The system design

and the system function coding should be created follow a standard such as the function naming standard so that the code is easy to understand and trace for the future maintenance of the system can be done easily. If the system errors occurred, it should also be able to correct easily within a short period and if the user requirement is changed, it should be able to enhance easily.

CHAPTER 5: SYSTEM DESIGN

5.1 Introduction

Systems design [33] is the process of defining the hardware and software architecture, components, modules, interfaces, and data for a computer system to satisfy specified requirements. Normally, refer as the application of systems theory to computing. This is inevitable of overlap with the discipline of systems analysis.

Standardization of hardware and software in the 1990s which resulted in the ability to build modular systems, systems design had a more crucial and respected role in the data processing industry. Software running on generic platforms has increasing and enhanced the discipline of software engineering at systems design's expense.

The most widely used methods for system design are object-oriented analysis and design methods. The standard language used in Object-oriented analysis and design is the UML. It is widely used for modeling software systems and is increasingly used for designing non-software systems and organizations.

5.1.1 A System Design Provides the Following Benefits [34]:

- ✓ Improved system performance; individually tailored configuration advice demonstrates where improvement is necessary, and how to improve the system to regain lost performance.

- ✓ Customers gain a detailed understanding of how their users use their system. This Usage Profile can be leveraged to develop future architecture changes.
- ✓ Potential to learn of future concerns, allowing customers to take proactive measures to avoid problems.
- ✓ A baseline performance level is established against which benefits can be compared and changes to the system predicted or foreseen.

5.2 System Architecture

System architecture [35] is a description of the design and contents of a computer system. If documented, it may include information such as a detailed inventory of current hardware, software and networking capabilities.

The system architecture [36] can be divided into two categories which is logical architecture and physical architecture.

- ✓ Logical Architecture - Define the system in terms of its software components and the desired functionality of those components.
- ✓ Physical Architecture - Define the hardware and 3rd-party software needed to host and maintain a website.

Virtual Reality Hypermarket is a web-based virtual environment hypermarket which is in three-dimensional environment with the detail information and

location of the product. Most of today websites are built on variant of the n-tier logical architecture model. For Virtual Reality Hypermarket logical architecture, it is 2-tier architecture.

5.2.1 2-Tier Architecture Client Server

Presentation tier or Client interacts with the user and sends requests to the application layer (server)

Application tier (server) performs processing on behalf of the client and sends it the results to display it is also responsible for any data storage

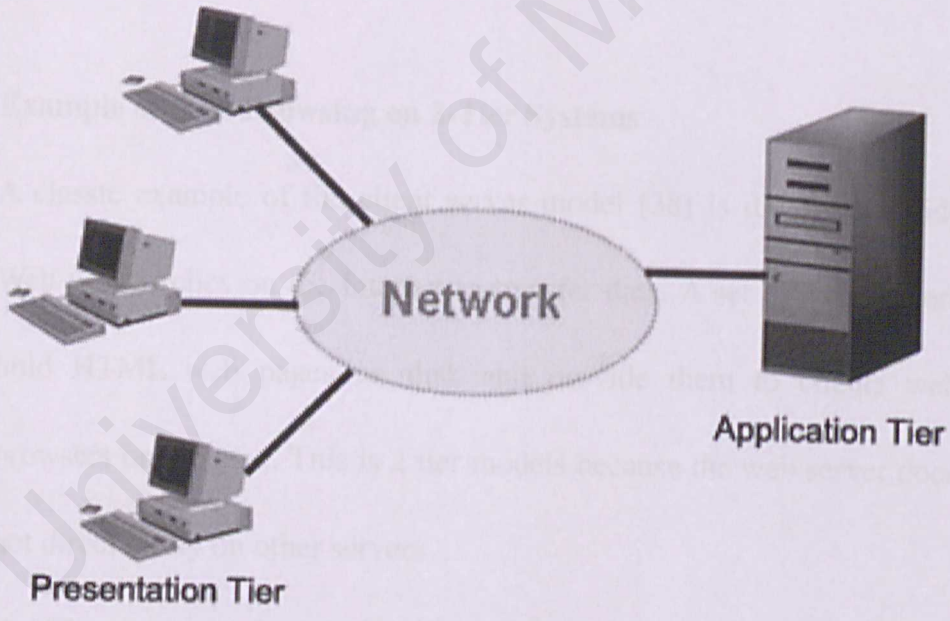


Figure 5. 1 : 2-Tier Client Server

5.2.2 Designing 2-Tier Systems

When build a 2-tier system [37], go through the following steps:

1. Develop the data model. Understand what information is to be stored and how it will be represented.

2. Describe the transactions that can take place on the data. This involves determining the SQL updates, inserts, and queries that are going to be used.

3. Design the page flow. This describes how users interact with the system. Document how user interaction with the pages triggers the transactions that determined were important in the last step and, as a result, how that affects the data model.

4. Implement the database, transactions, and individual pages that follow our design.

5.2.3 Example of Web Browsing on 2-Tier Systems

A classic example of the client server model [38] is the World Wide Web which relies on the Internet to transfer data. A set of web servers hold HTML web pages on disk and provide them to clients web browsers on demand. This is 2 tier models because the web server does not directly rely on other servers

- ✓ The server is called the application tier
- ✓ The client is called the presentation tier

Web servers allow the user to write programs which generate the HTML the client's web browser will display. This is still a two tier system because the programs are under the control of the web browser and are not independent of it. The programs the web server runs are responsible

for doing the processing and data storage to generate the web pages the server will send to the client. In Web program scenario, the browser provides a universal user interface through client-side technology (HTML, JavaScript). The application runs on the server side to handle client requests and ASP, JSP, PHP or other technologies generate the HTML

5.3 System Design Structure

System Design Structure delivers a preview of the whole system to be developed. In the system design phase [39], it was based on the user requirements and the detailed analysis of a new system, the new system must be designed. Normally, the design proceeds in two stages:

- ✓ preliminary or general design
- ✓ Structure or detailed design

5.3.1 Preliminary or General Design

- ✓ New system's feature is specified.
- ✓ Estimate the costs of implementing these features and the benefits driven
- ✓ If project consider feasible, move to detail design stage.

5.3.2 Structure or Detailed design

At this stage, the design of the system becomes more structured.

Structure design is a blue print of a computer system solution to a given problem having the same components and inter-relationship among the same components as the original problem. Input, output and processing specifications are drawn up in detail.

There are several tools and techniques used for designing. These tools and techniques are:

- ✓ Flowchart
- ✓ Data flow diagram (DFDs)
- ✓ Data dictionary
- ✓ Structured English
- ✓ Decision table
- ✓ Decision tree

5.4 Data Flow Diagram (DFD)

5.4.1 Context diagram for Administrator Interface

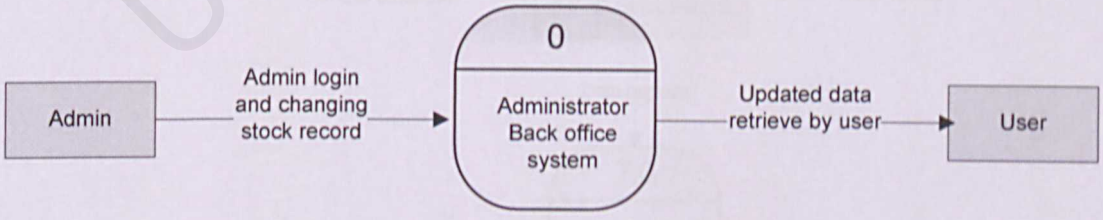


Figure 5. 2 : Context diagram for Administrator Interface

5.4.2 Level-0 DFD for Administrator Interface

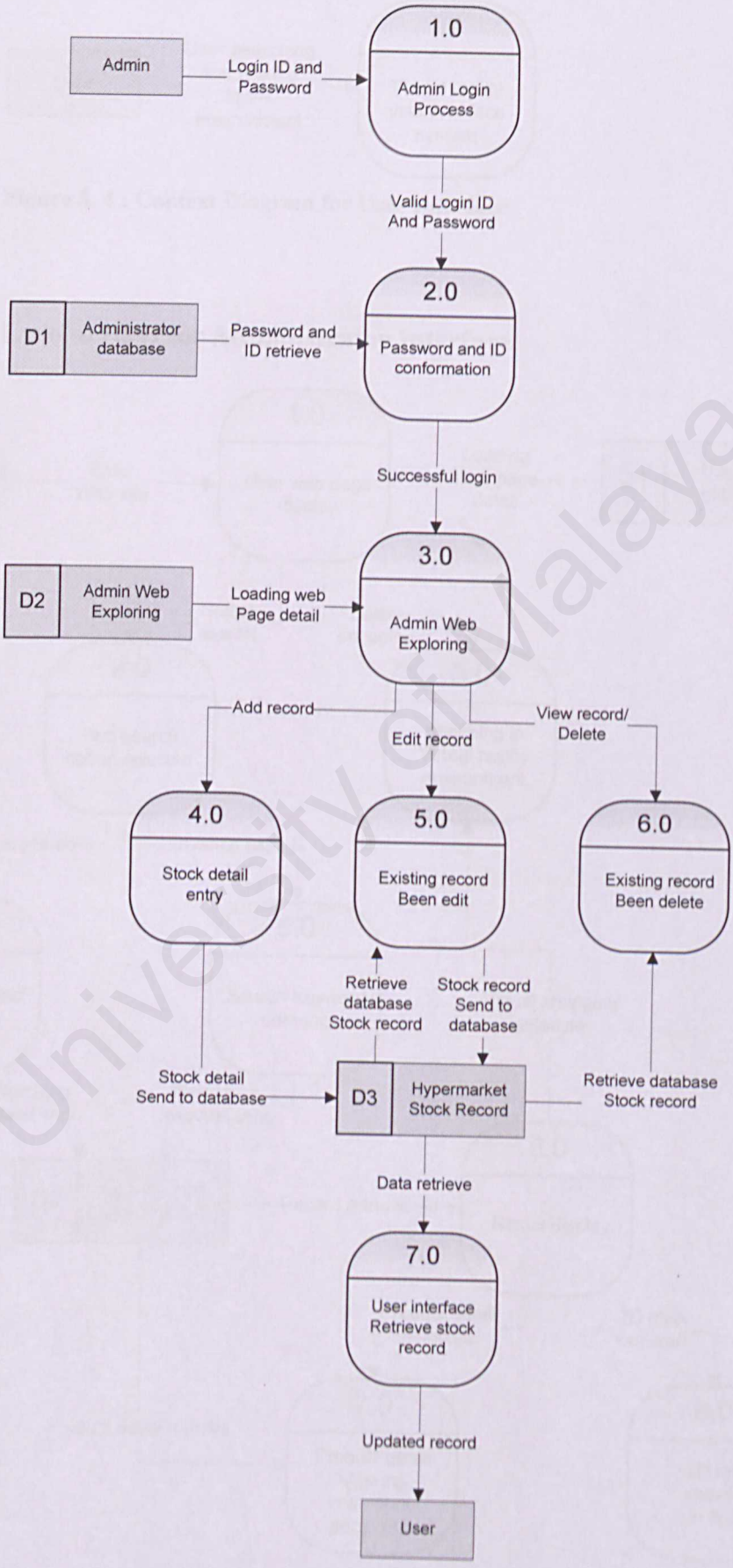


Figure 5. 3 : Level-0 DFD for Administrator Interface

5.4.3 Context Diagram for User Interface

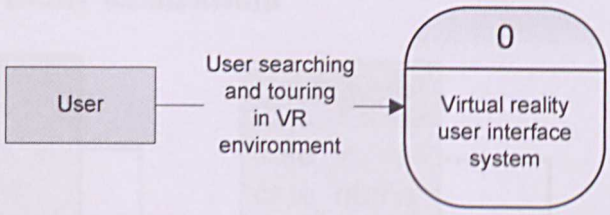


Figure 5. 4 : Context Diagram for User Interface

5.4.4 Level-0 DFD for Administrator Interface

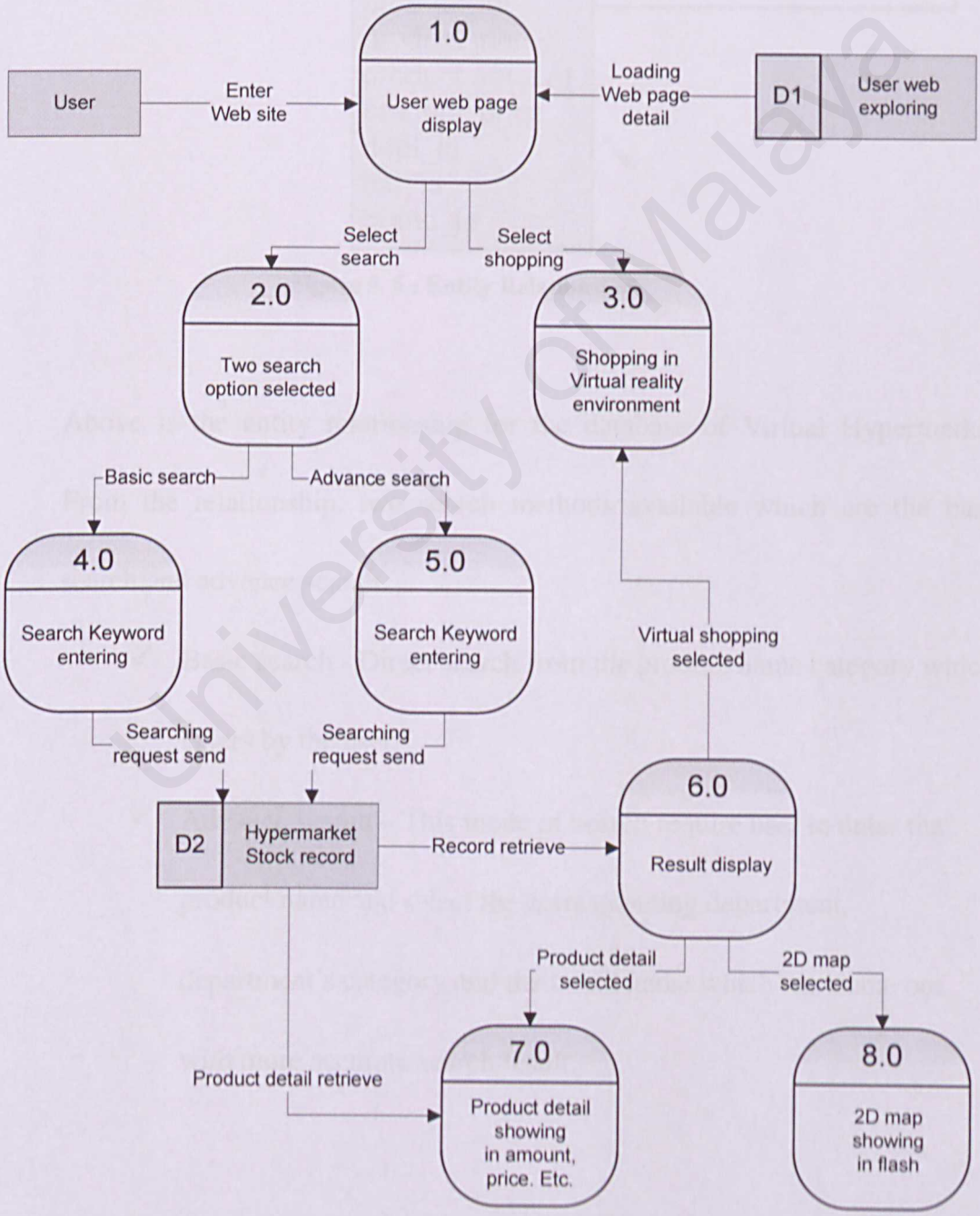


Figure 5. 5 : Level-0 DFD for User Interface

5.5 Database Design

5.5.1 Entity Relationship

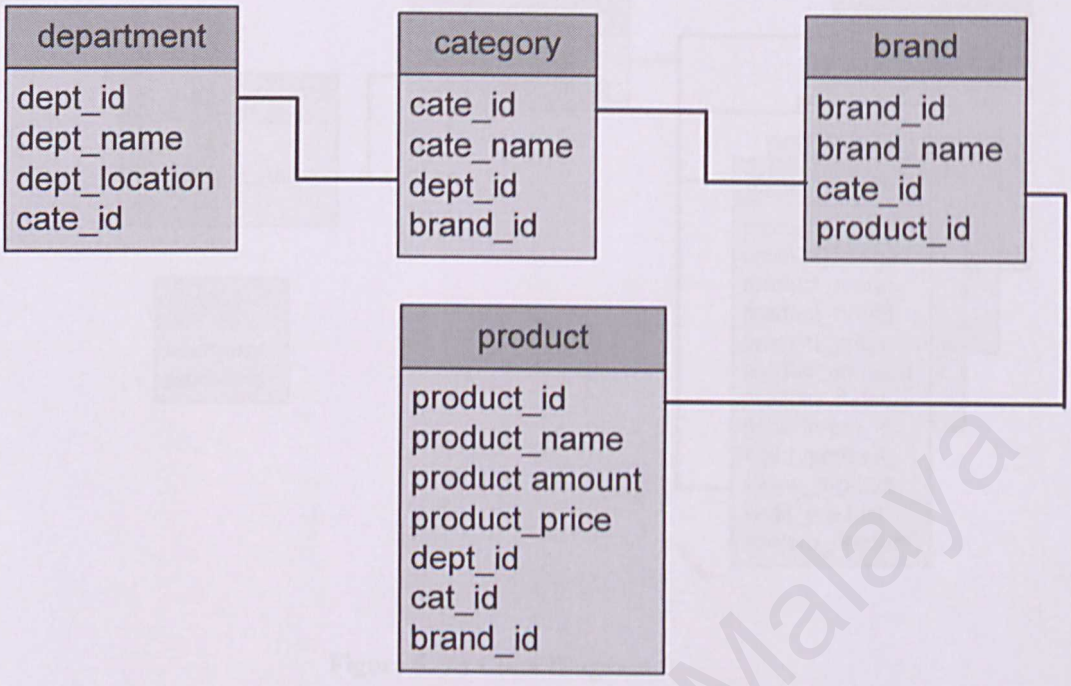


Figure 5. 6 : Entity Relationship

Above is the entity relationship for the database of Virtual Hypermarket. From the relationship, two search methods available which are the basic search and advance search.

- ✓ Basic search - Direct search from the product name category which enters by the user.
- ✓ Advance search – This mode of search require user to enter the product name and select the corresponding department, department's category and the brand name which can come out with more accurate search result.

5.5.2 Class Diagram

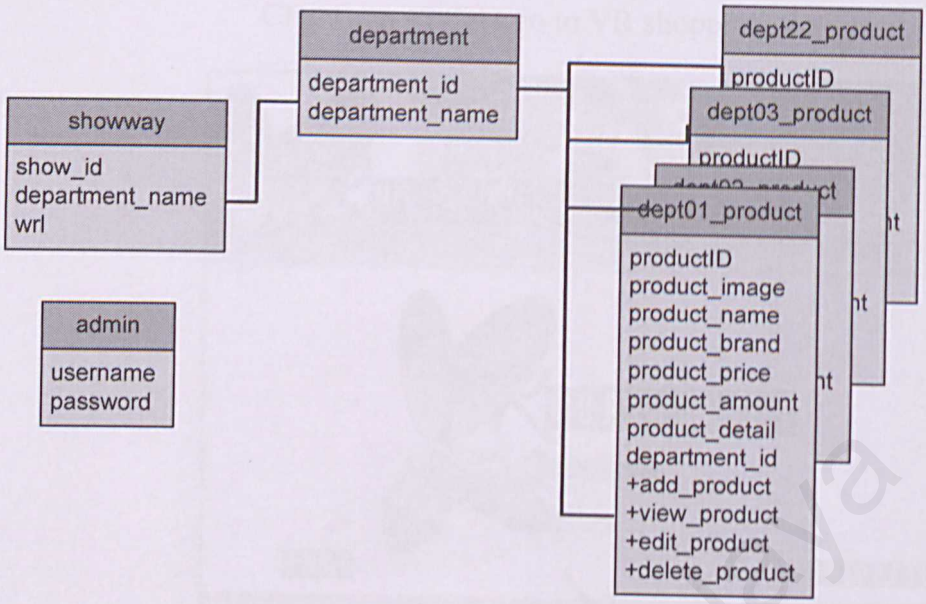


Figure 5. 7 : Class Diagram

5.6 User Interface Design

Virtual Reality Hypermarket is a web base system that can let the client of hypermarket had online virtual tour the hypermarket environment before entering the hypermarket and checking the stock availability of the stock. This manual is a guide to help client visiting the web site in right way in order had fully using the function inside the VR environment.

5.6.1 Client Section

5.6.1.1 Main Page

Here is the intro flash, the client can select to:

- Home

  Here is the home page of the web site. From here, user can navigate to other section as well.

- Shopping

Client can straight go to VR shopping section.

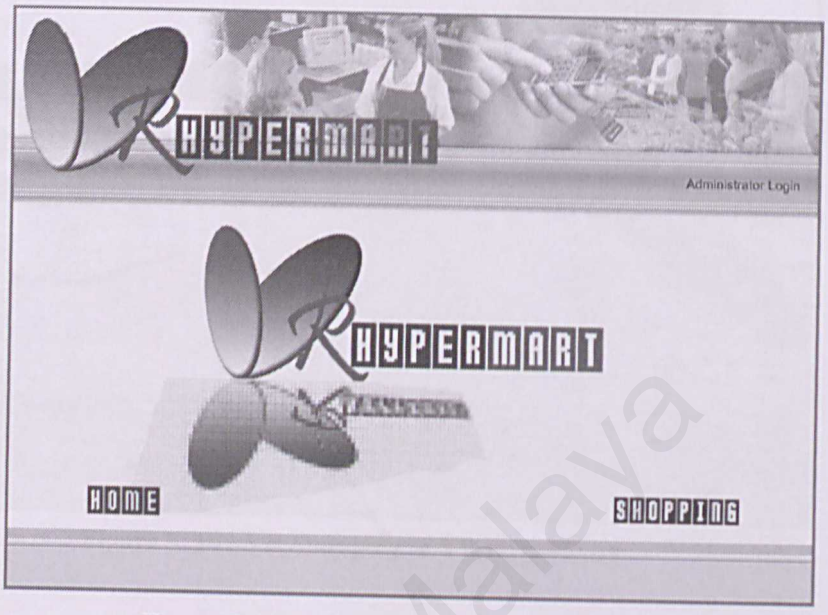


Figure 5. 8 : Main Page of VR Hypermart

5.6.1.2 Home Page

Here is a simple introduction about the Virtual Reality Hypermarket.

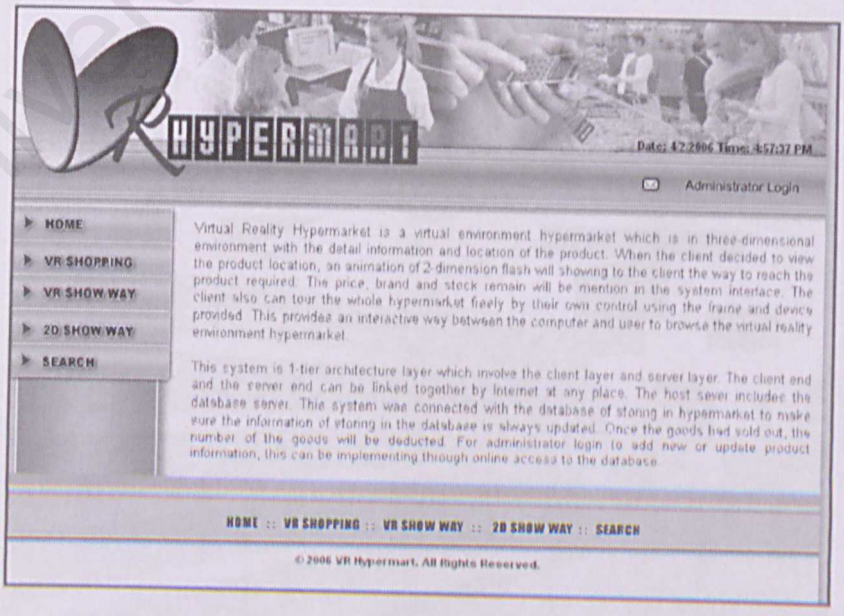


Figure 5. 9 : Home Page of VR Hypermart

5.6.1.3 VR Shopping

Figure 5. 10 : VR Shopping of VR Hypermart

This is the virtual environment of the hypermarket. Here client can tour the environment freely. Here got three functions available which are listed at the following:

- Check Product Detail

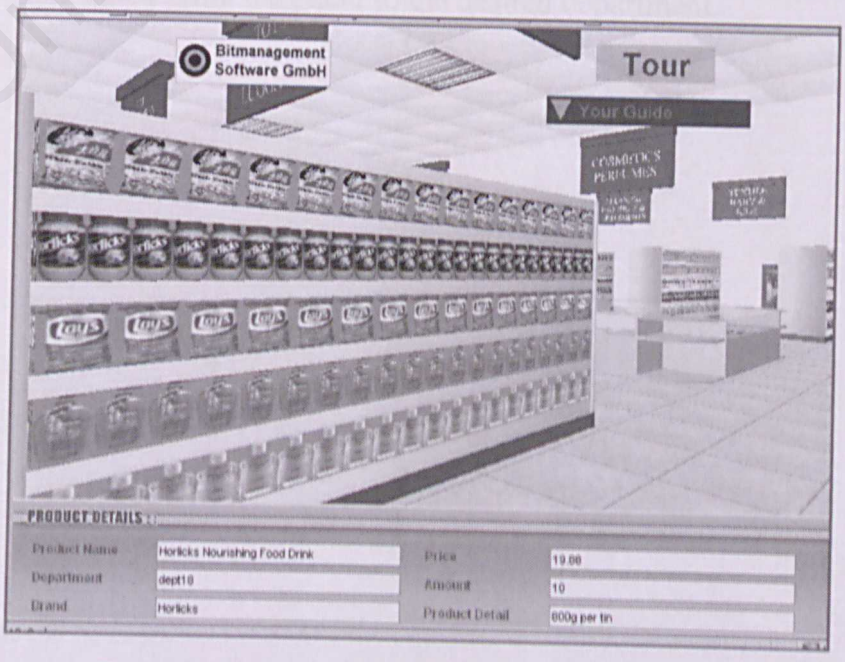


Figure 5. 11 : Check Product Detail in VR Shopping

When client click the product image, the product details will be showing at the bottom footer.

- Drop-down View Point Selected

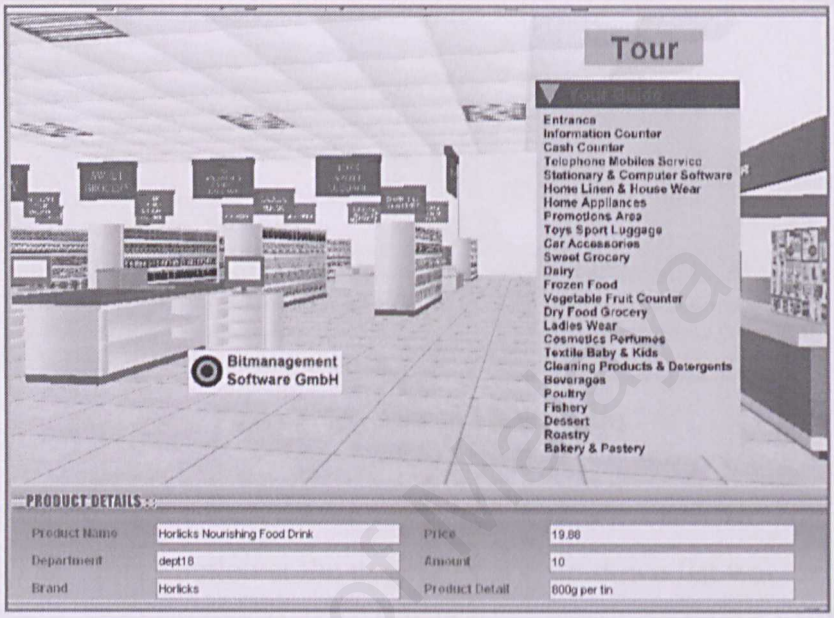


Figure 5. 12 : View Point Selection in VR Shopping

The drop-down list was listed all together 24 department of the view point. The client can select from the list where will had quick bring the client to the desired department.

- VR movie Touring

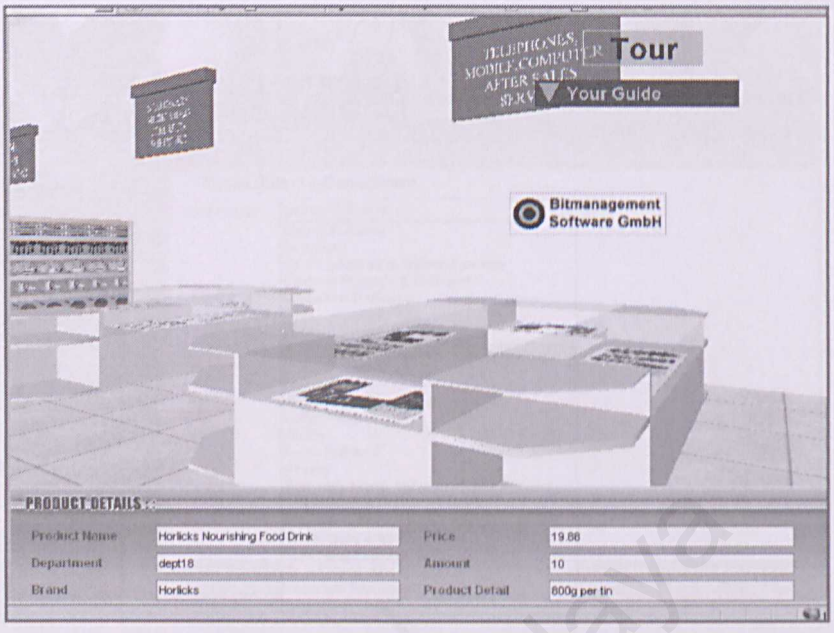


Figure 5. 13 : Tour in VR Shopping

The "Tour" button at the upper of the drop-down list was the start and stop button for VR movie of the touring the whole VR hypermarket. Just simply click the tour button, the movie will start. When movie was running, click again the "tour" button, the movie will be stop.

5.6.1.4 VR Show Way

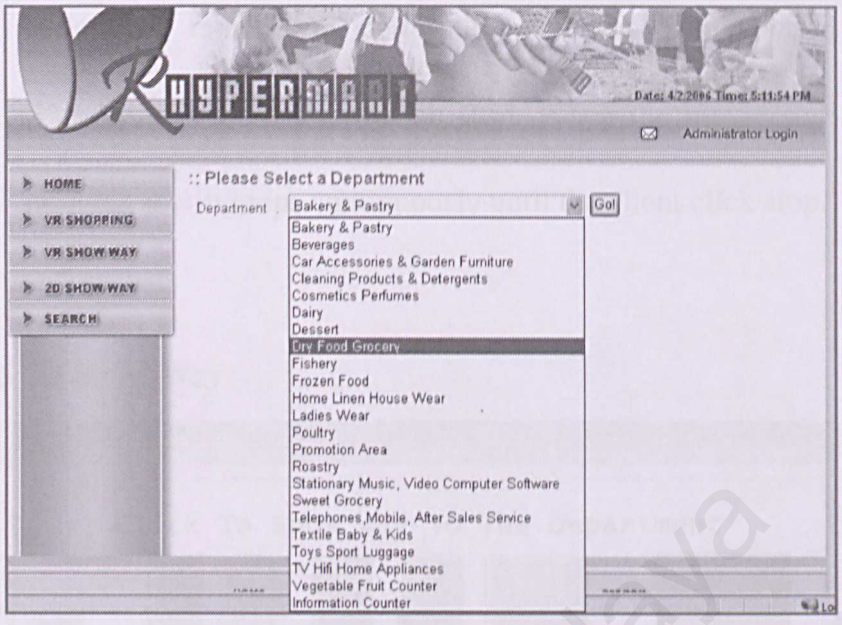


Figure 5. 14 : VR Show Way in VR Hypermart

The client can select the desired department from the drop-down list, then click "go" button. The VR movie will be load.

Figure 5. 15 : VR Show Way II in VR Hypermart

When the VR movie was load, just simply click the "start" button, the movie will start running. When "start" button click again, the movie will be stop. When the movie start running, it will loops continuously until the client click stop.

5.6.1.5 2D Show Way

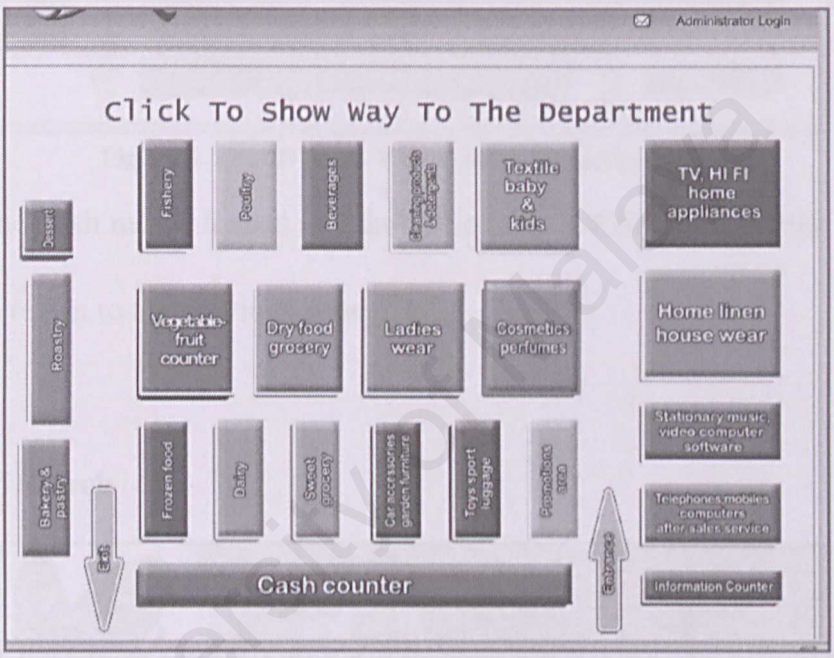


Figure 5. 16 : 2D Show Way in VR Hypermart

The client can select the desired department from the 2D flash map, and then double click; the flash movie will be loaded.

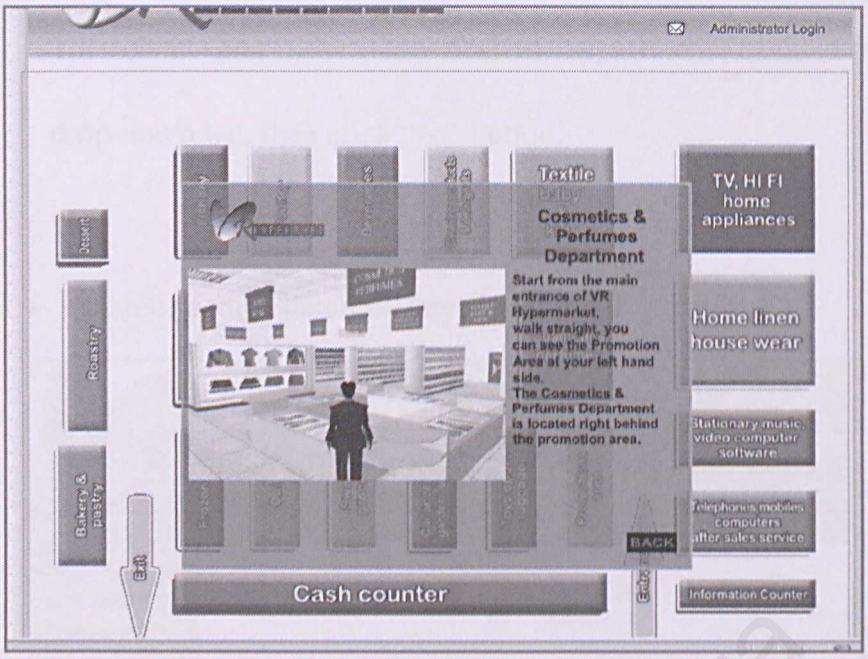


Figure 5. 17 : 2D Show Way II in VR Hypermart

The flash movie loaded and the audio started. Click back button to return to the previous page.

5.6.1.6 Search

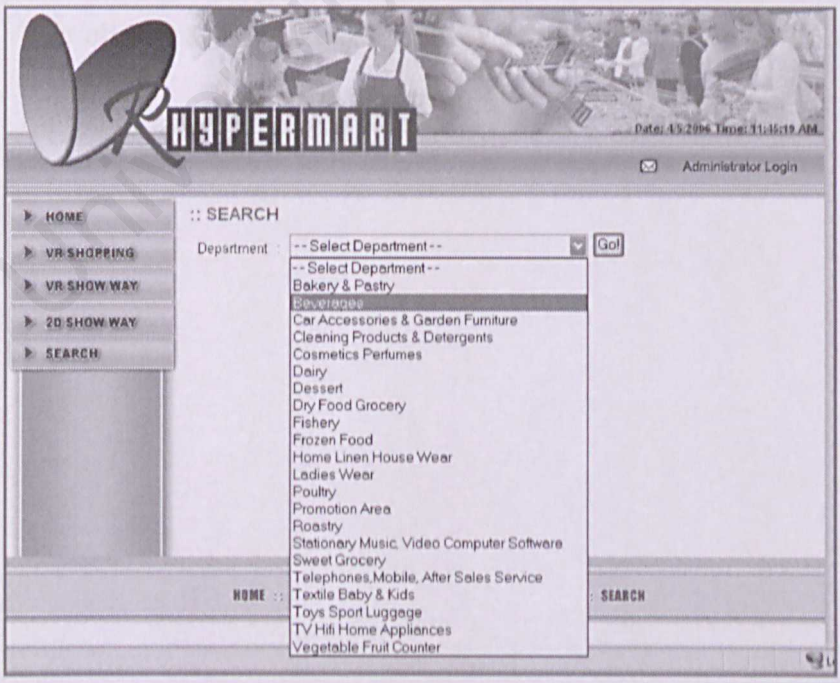


Figure 5. 18 : Search Drop-down list in VR Hypermart

The client can select the desired department from the drop-down list, then click "go" button.

- Search product detail by keywords

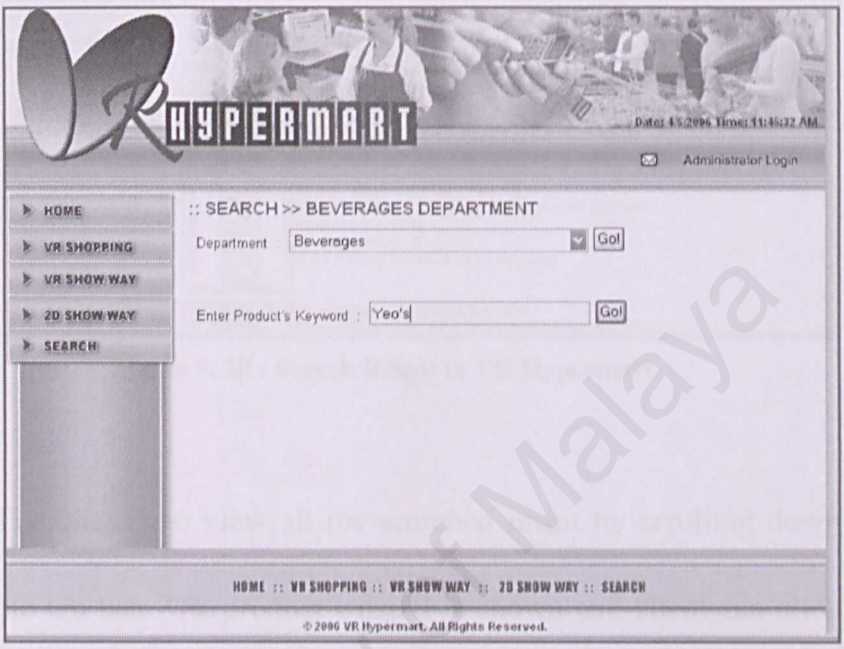


Figure 5. 19 : Search Keyword in VR Hypermart

The client can type in the product keywords and click "go" button to load the search result.

- **Search result found**

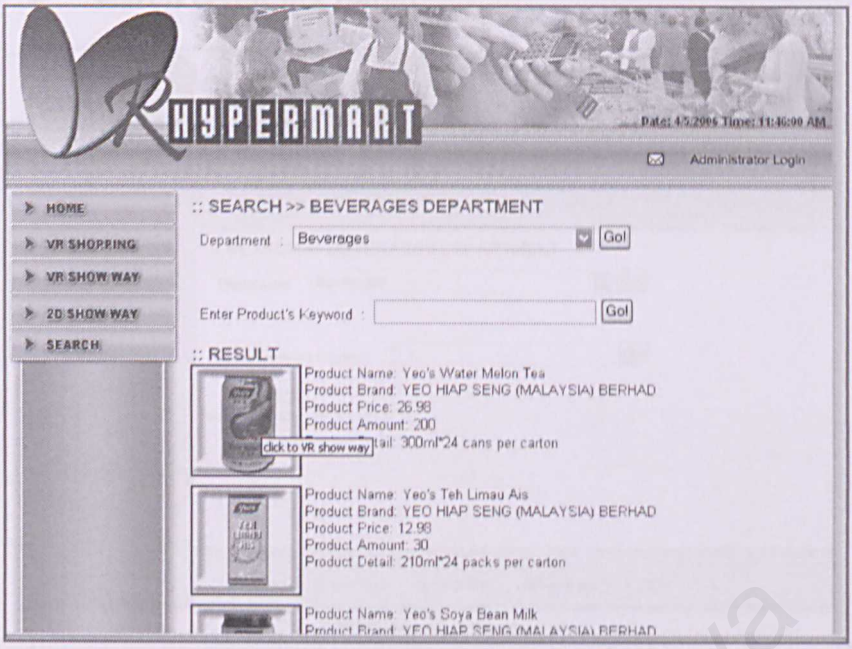


Figure 5. 20 : Search Result in VR Hypermart

The client can view all the searched result by scrolling down the tab bar. The product's detail is shown and client can click on the product image to view the product location in VR show way in a new windows.

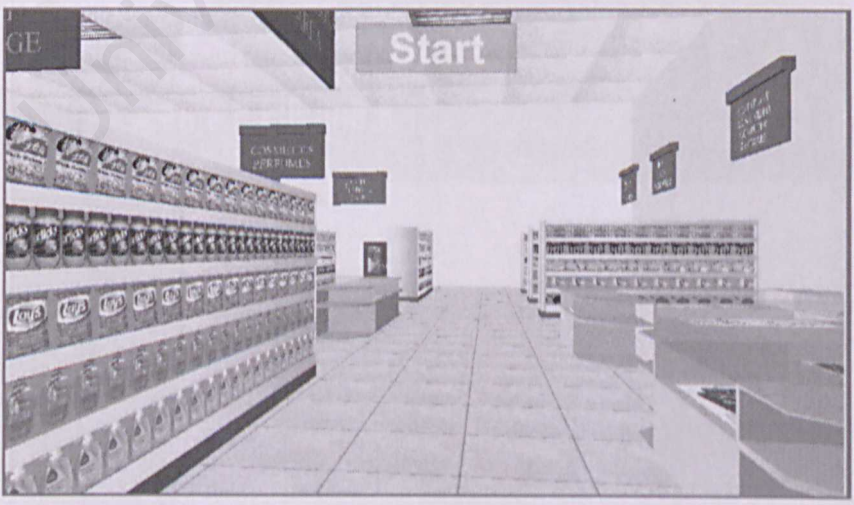


Figure 5. 21 : Search Result in VR Show Way

The VR show way loaded after click on the product images.

- **Search result not found**

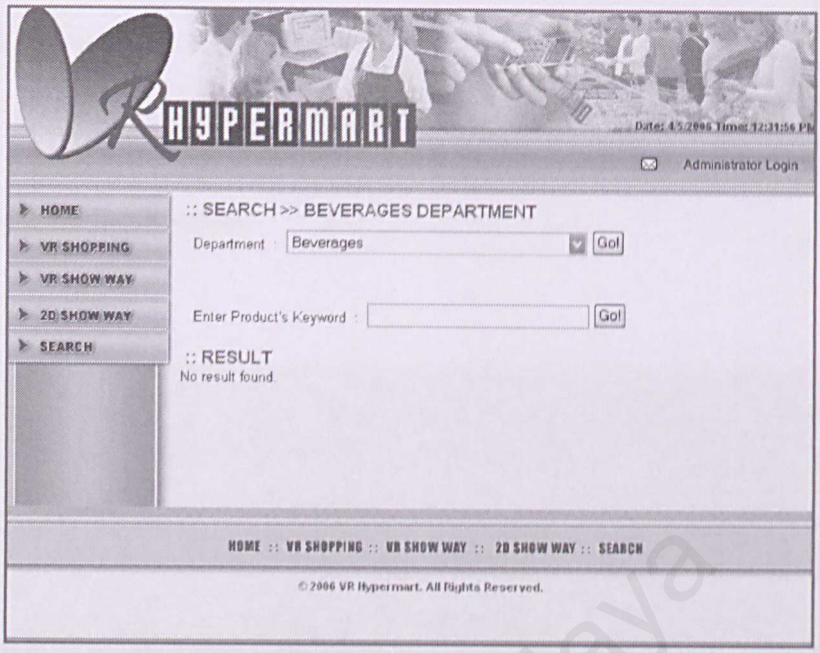


Figure 5. 22 : Search Result II in VR Hypermart

No result found page will be shown if there is no match for the client search item.

5.6.1.7 Contact Us

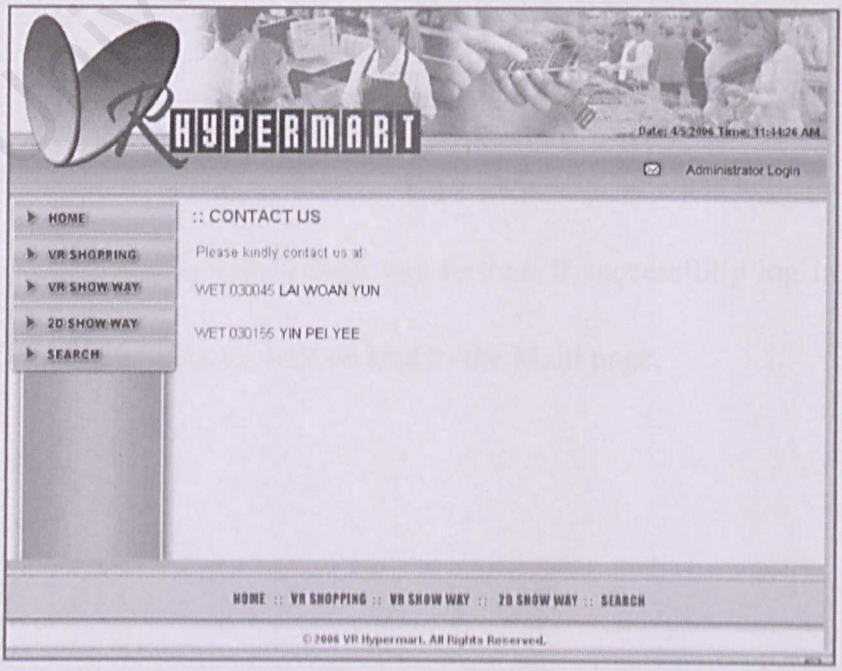


Figure 5. 23 : Contact Us in VR Hypermart

The client can click on the name hyperlink to email to the VR hyper mart administrator.

5.6.2 Admin Back Office Section

5.6.2.1 Log In

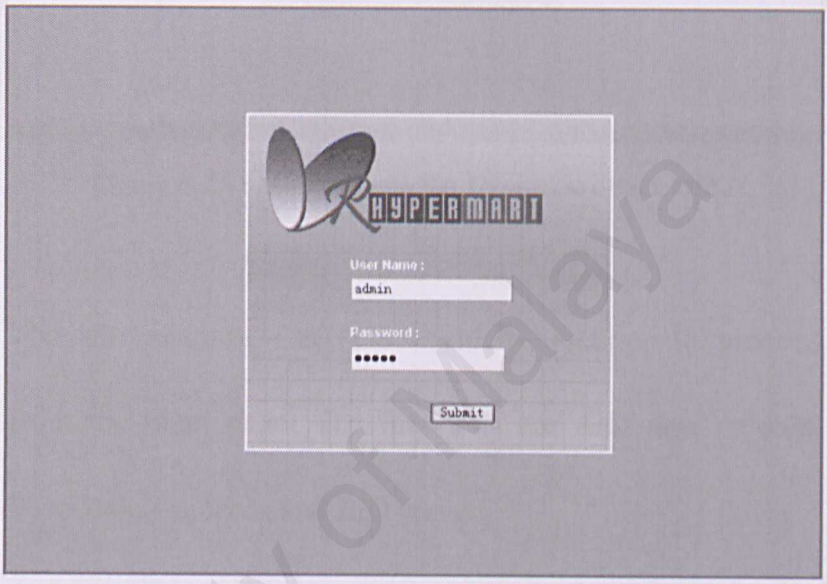


Figure 5. 24 : Administrator Log In in VR Hypermart Back Office

The administrator need to authorize log in by enter their user name and password, and then click the 'submit' button to proceed. If the username or password is not matched, the administrator can not go any further. If successfully log in, the administrator will be lead to the Main page.

5.6.2.2 Main Page

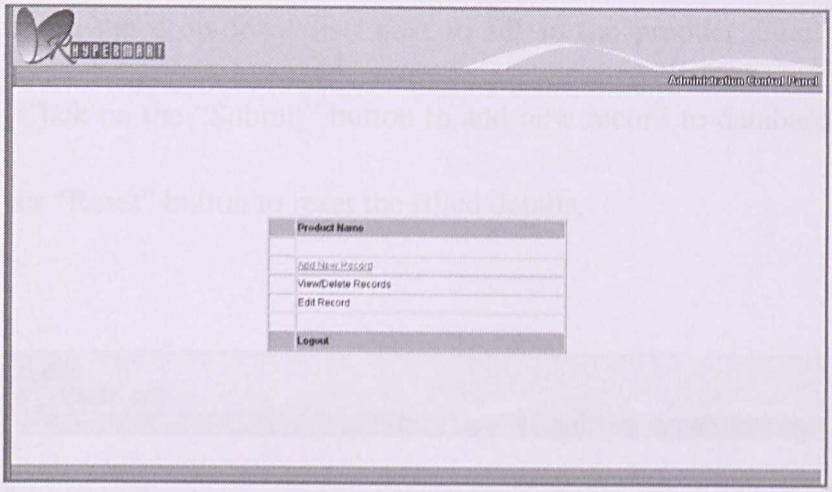


Figure 5. 25 : Main Page in VR Hypermart Back Office

The administrator can select which functions to proceed from the main page. The functions are Add new records, View/delete records and Edit record.

5.6.2.3 Add New Record

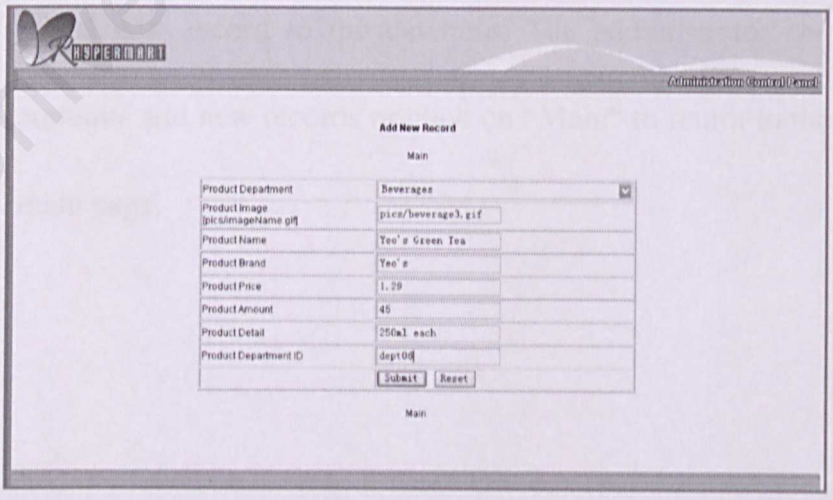


Figure 5. 26 : Add New Record in VR Hypermart Back Office

The administrator needs to select the desired department from the drop-down list, next to fill in the product detail. Click on the "Submit" button to add new record to database or "Reset" button to reset the filled details.

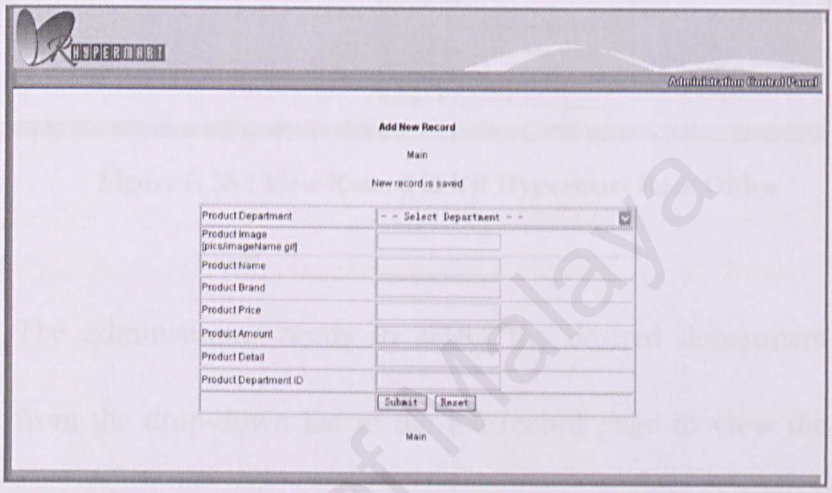


Figure 5. 27 : New Record Added in VR Hypermart Back Office

The new record is saved page shown after successfully added new record to the database. The administrator can continue add new records or click on "Main" to return to the main page.

5.6.2.4 View/Delete Record

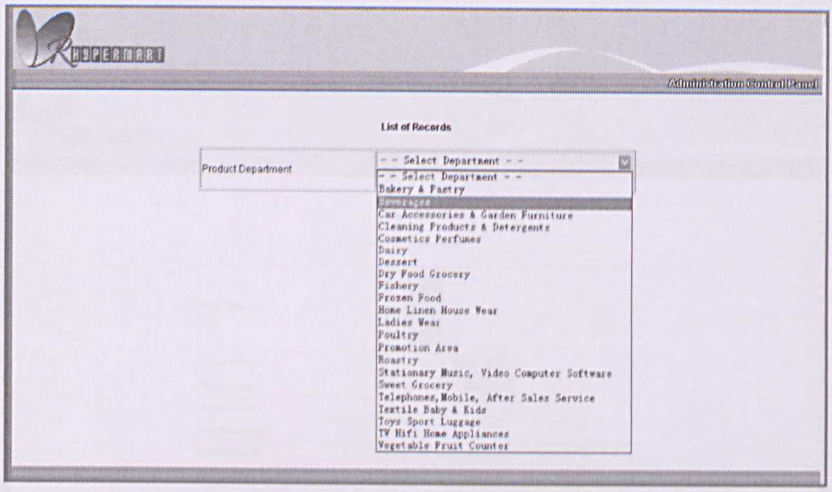


Figure 5. 28 : View Record in VR Hypermart Back Office

The administrator needs to select the desired department from the drop-down list in the list record page to view the selected department's products.

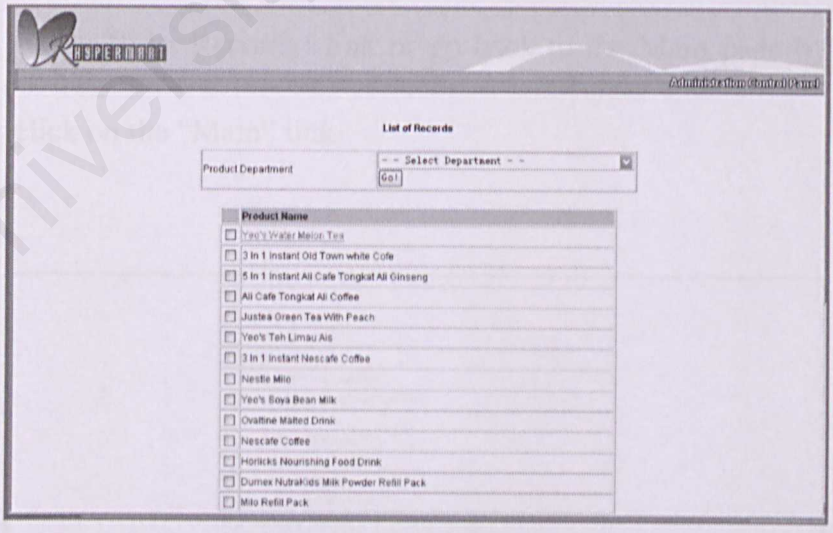


Figure 5. 29 : View List Record in VR Hypermart Back Office

The administrator needs to select and click the desired product name from the list in the list record page to view the

product's detail.

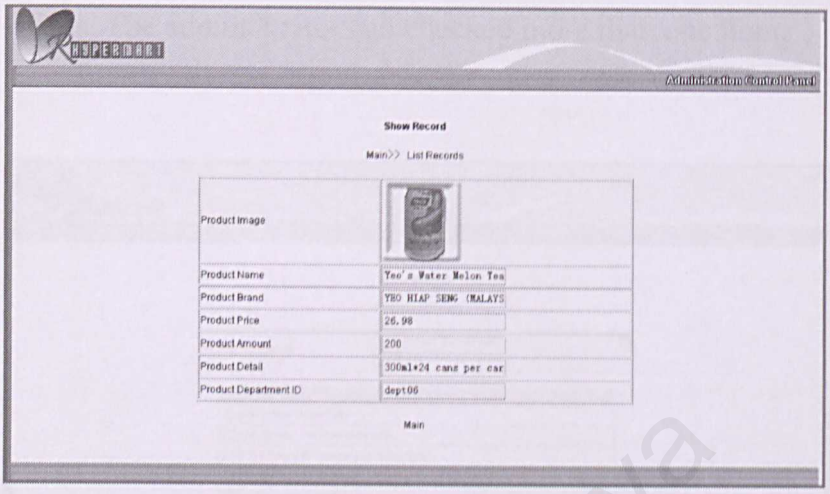


Figure 5. 30 : View Selected Record in VR Hypermart Back Office

The administrator can to view the product's detail after clicked on the product name in the previous pages. The administrator can go back to the List Record page by click on the "List Records" link or go back to the Main page by click on the "Main" link.

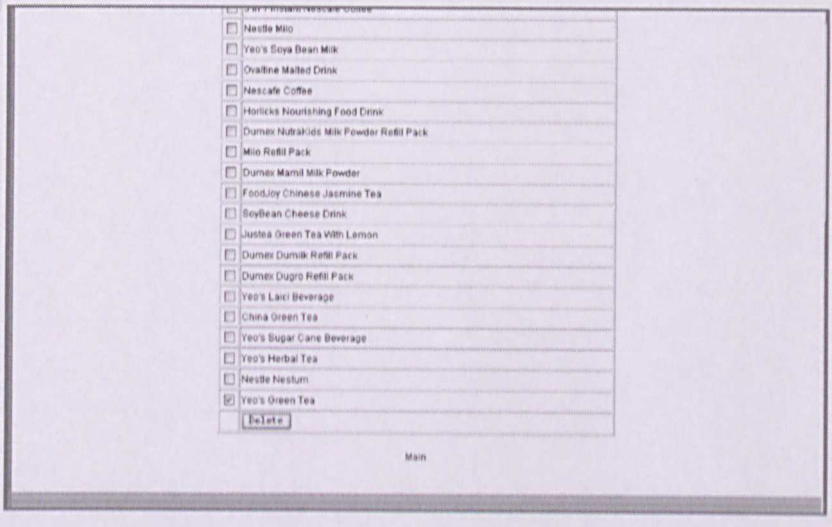


Figure 5. 31 : Delete Record in VR Hypermart Back Office

The administrator needs to check on the selected product's check box and clicking the "delete" button to delete the items. The administrator can checked more than one item.

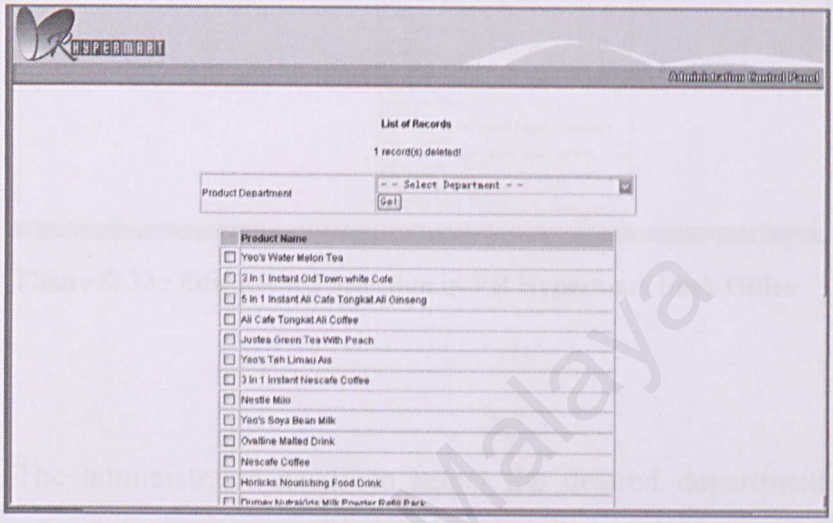


Figure 5. 32 : Record Deleted in VR Hypermart Back Office

The record(s) deleted page shown after successfully delete record(s) from the database. The administrator can continue view/delete records or click on "Main" to return to the main page.

5.6.2.5 Edit Record

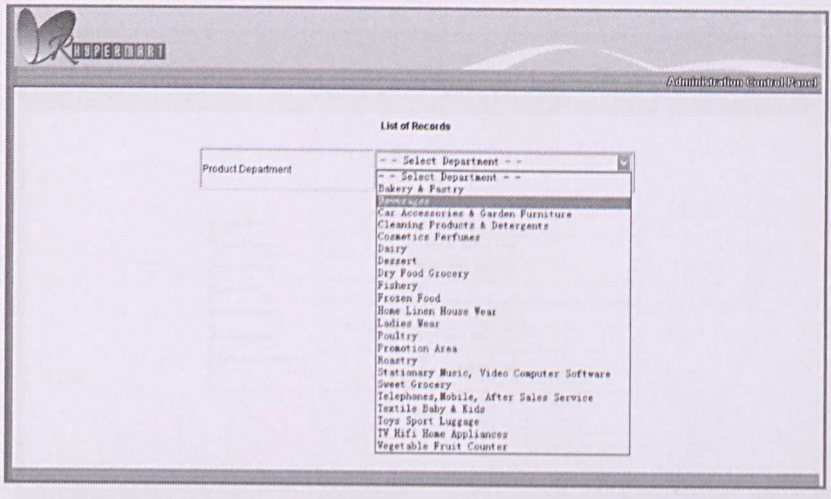


Figure 5. 33 : Edit Record Selection in VR Hypermart Back Office

The administrator needs to select the desired department from the drop-down list in the list record page to further edit the selected department's products.

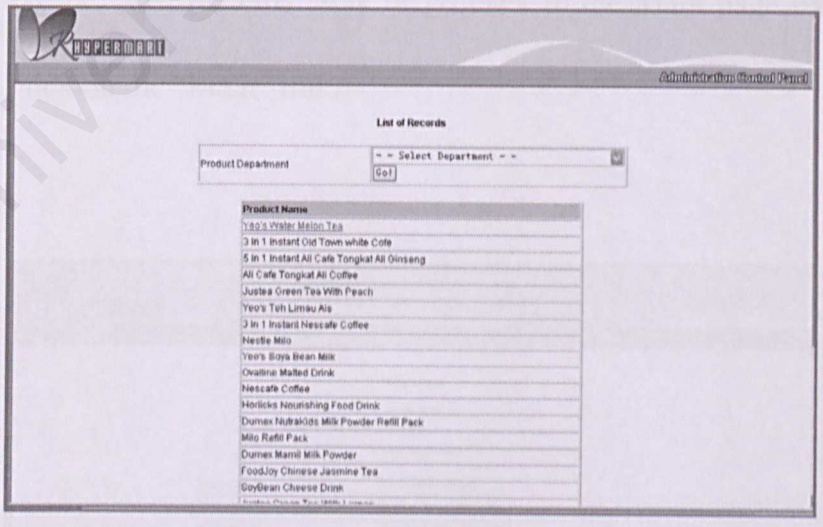


Figure 5. 34 : Edit List Record in VR Hypermart Back Office

The administrator needs to select and click the desired product name from the list in the list record page to further

edit the product's detail.

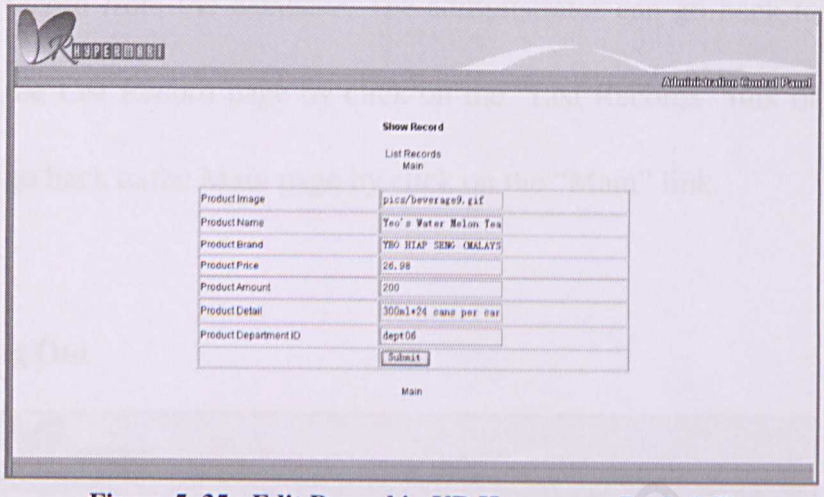


Figure 5. 35 : Edit Record in VR Hypermart Back Office

The administrator can edit the product's detail after clicked on the product name in the previous pages. Click on the "Submit" button to save the edited record to database. The administrator can go back to the List Record page by click on the "List Records" link or go back to the Main page by click on the "Main" link.

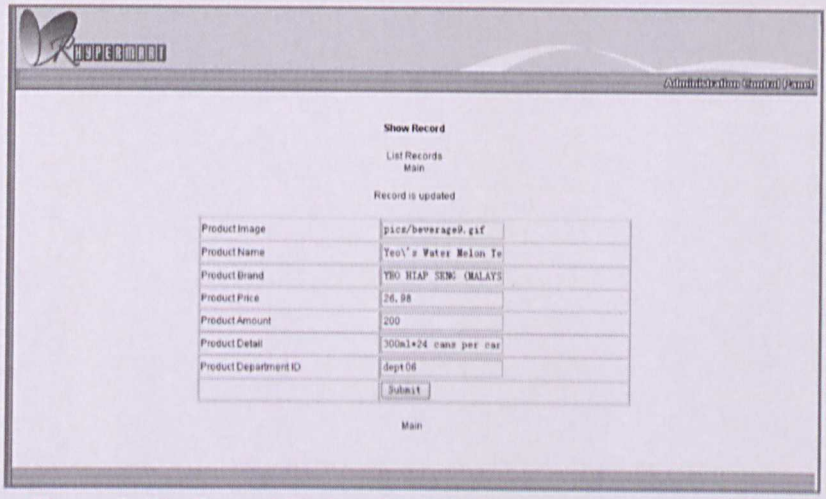


Figure 5. 36 : Record Updated in VR Hypermart Back Office

The record is updates page shown after successfully edit record from the database. The administrator can go back to the List Record page by click on the "List Records" link or go back to the Main page by click on the "Main" link.

5.6.2.6 Log Out

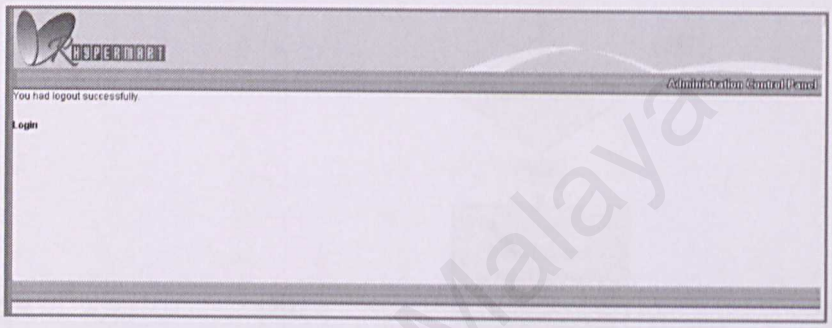
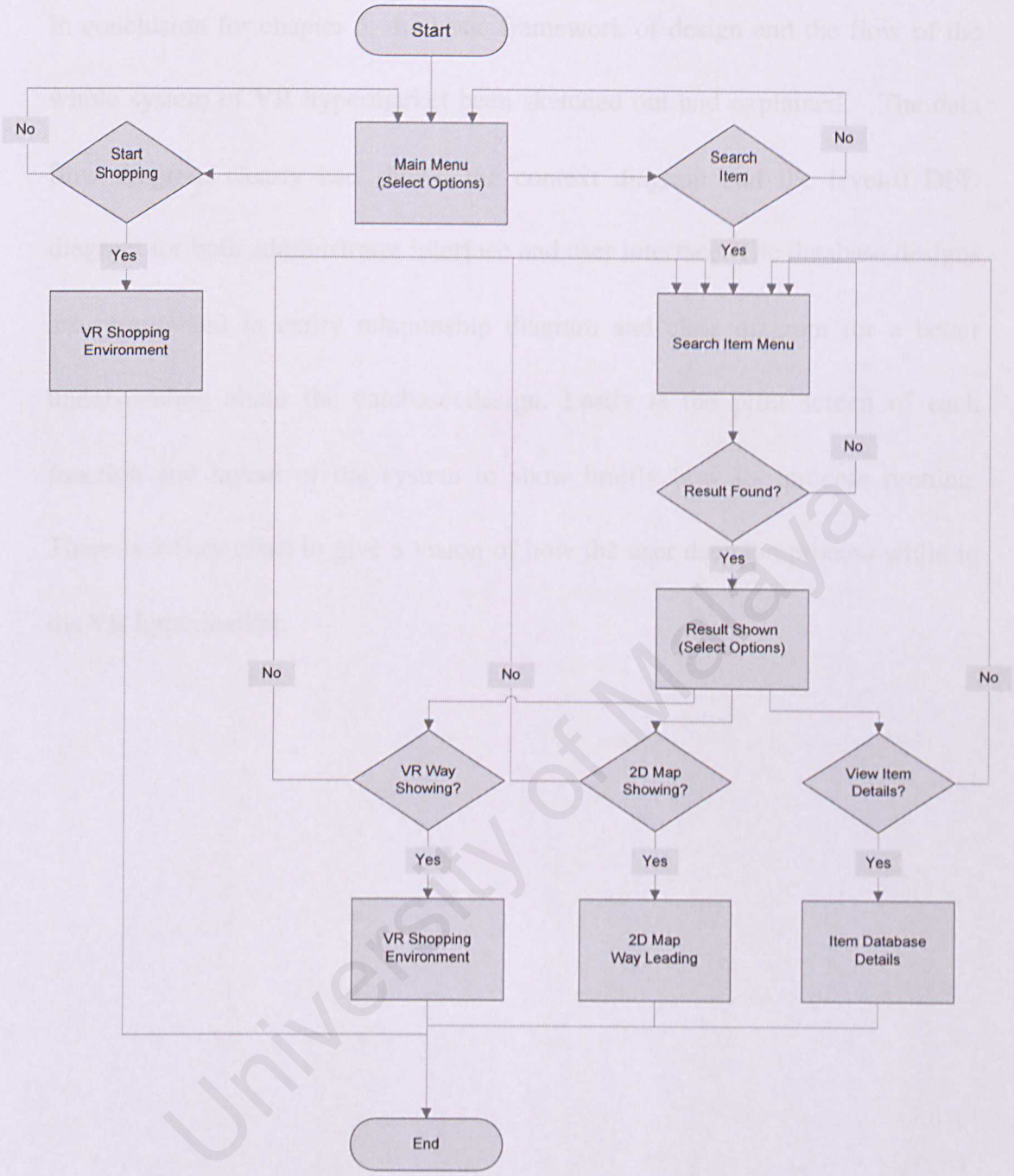


Figure 5. 37 : Log Out in VR Hypermart Back Office

The administrator requires clicking on the log out in the main page button to log out. The administrator can re-log in from the successfully log out page.

5.7 Flow Chart



5.8 Summary

In conclusion for chapter 5, the basic framework of design and the flow of the whole system of VR hypermarket been sketched out and explained. The data flow diagram clearly had shown the context diagram and the level-0 DFD diagram for both administrator interface and user interface. The database designs are represented in entity relationship diagram and class diagram for a better understanding about the database design. Lastly is the print screen of each function and layout of the system to show briefly how the process running. There is a flow chart to give a vision of how the user decision process while in the VR hypermarket.

CHAPTER 6 SYSTEM TESTING

6.1 Introduction

In general, the term 'system testing' refers to the testing of the system in artificial conditions to ensure that it should perform as expected and as required.

From a Systems Development perspective [40], System Testing refers to the testing performed by the development team (the programmers and other technicians) to ensure that the system works module by module ('unit testing') and also as a whole. Each module at the lowest level of the system hierarchy is tested individually. Then, all the tested modules would be related to the next module testing. This approach is repeated until all the modules are tested successfully.

System Testing should ensure that each function of the system works as expected and that any errors (bugs) are noted and analyzed. It should additionally ensure that interfaces for export and import routines, function as required. System Testing does not concern itself with the functionality of the system and whether this is appropriate to meet the needs of the users.

6.2 Testing Process

In general, the testing process of Virtual Reality Hypermarket can be shown in the following figure. All the details will be further explained in subsequent

sub-sections.

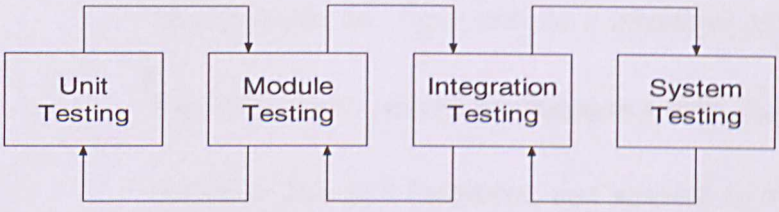


Figure 6. 1 : Testing Process

6.2.1 Unit Testing

Unit test is the process to test the individual component to ensure that they function properly. Each component is tested independently without the interference from other system components. Unit test is performed concurrently with the development process.

Techniques used during the process of performing unit testing are as follows:

- Code Review

  Inside the VRML file (*.wrl), codes are reviewed line by line to discover any syntax error as well as semantic error. If errors are discovered, they are corrected immediately. By using the VrmlPad, the error can be easily traced it had some advance feature which is fields validation macro and dynamic errors detection.

- Other techniques

  Inside the vrml coding, there will be other function added to the environment. So, there will be a comment add to let us can easily traced the error path of the function added. Any line that starts with a # character is a comment, and ignored by the VRML parser, so add comments to the files can be using this method.

6.2.2 Module Testing

Module testing is performed without other system modules. Each module consist a collection of dependent components to perform particular task or function. Test cases of different possible are applied to module and test result would be verified. Unusual results will be analyzed and they would help in debugging sub-modules in order to produce the desired output.

6.2.3 Integration Testing

Integration testing is testing two or more modules or functions together with the intent of finding interface defects between the modules or functions. Integration Testing is the testing of collection of unit testing (Module testing) which is already conducted by software developer. In Integration Testing the interface also checked, i.e. after combining this module whether they give the desired result.

Several important aspects are checked to ensure that the flow of the data in Virtual Reality Hypermarket is well organized and are user friendly to all the system users.

6.2.4 System Testing

Several modules constitute a project. Once all the modules are integrated, several errors may arise. The testing done at this stage is called system test. System testing is to find errors that result from unanticipated interactions between sub-systems. Besides, it is used to validate whether the system meets its functional and non-functional requirement.

Problems might occur by the time the new developed system is integrated to existing system. There are few possibilities that might lead to this mismatch of both new and old system

- Interface mismatch

As Virtual Reality Hypermarket is a totally separate system. Virtual Reality Hypermarket has its own set of interfaces which in *.wrl file where we embedded into *.html file. In the *.html file, the layout is setting the frame. There is calling inside *.wrl file to *.php file on other frame inside the same *.html file. But, there's no mismatch occurs.

- Data type mismatch

Virtual Reality Hypermarket has its own database to store data at the beginning stage, admin login information such as username and password are retrieved from another database.

Finally, a performance test is performed to compare the integrated modules with the non-functional system requirements. These requirements include security, interoperability, flexibility and reliability.

6.3 Conclusion

Testing on a system had been done successfully. Testing is important for ensuring the functionality of the system of the system has run correctly follow the user requirement.

CHAPTER 7 SYSTEM IMPLEMENTATION

7.1 Introduction

System implementation in software development is a process to convert system requirements into program codes. At the initial stage of system implementation is setting up the development environment where includes setting up development tools to facilitate the system implementation.

Generally, the development environment is suited according to different development phases, which can be categorized into system design, system development and report writing process.

7.1.1 System Design

The system design is stated in chapter 5, during the initial stage of system development, a few consideration and adjustment were done to initial system design to match the actual needs and requirements.

7.1.2 System Development

The basic tools used for the system development are:

i. VRML Pad

ii. Room Arranger

iii. Appserv

iv. SQLyog

v. Adobe Photoshop 7.0 (Image creation Tool)

vi. Macromedia Dreamweaver MX (Editor and interface creation tool)

vii. SwishMax (Flash intro and 2d show way)

viii. Microsoft Internet Explorer 6.0 (Web browser)

7.1.3 Report Writing

The problem meets and also the solutions found throughout the processes (from system implementation until system evaluation) were recorded as well as result from system testing and system integration.

7.2 System Coding – Coding Approach, Style and Scripting Language

7.2.1 Database Implementation

For Virtual Reality Hypermarket, the database is stored in a PC in which SQLyog was installed. SQLyog is compatible with MySQL 4.1.7 .Any data creation, updates or data retrieval will be connected directly to the database server through MySql.

The database includes tables to keep users' details including users' authentications information and also the table for stock of virtual reality hypermarket. Virtual Reality Hypermarket is an online application in which the admin can create, edit and delete any records directly into the

Virtual Reality Hypermarket database.

After the Virtual Reality Hypermarket is completed and tested successfully, all the raw data were flush from the database. All the unnecessary tables were eliminated from Virtual Reality Hypermarket database to avoid data overlapping and to reduce workload of the entire system when deployment.

7.2.2 Application Server Configuration

The Apache HTTP Server Project is an effort to develop and maintain an open-source HTTP server for modern operating systems including UNIX and Windows NT. The goal of this project is to provide a secure, efficient and extensible server that provides HTTP services in sync with the current HTTP standards.

Apache has been the most popular web server on the Internet since April 1996. The November 2005 Netcraft Web Server Survey found that more than 70% of the web sites on the Internet are using Apache, thus making it more widely used than all other web servers combined.

7.2.3 Program Implementation

PHP and HTML is used to develop the entire VR Hypermarket (while the virtual environment is using room arranger to generate the VRML code), with the PHP open source code.

PHP Page

Figure 7-1 indicated a PHP page (login.php). By using PHP class, the concept of inheritance and encapsulation can be manipulated thus it enhances class reusability that can lead to easier system expandability.

```
<?php
session_start();
include("cn.php");

$msg = "";
if (isset($_POST['Submit']))
{
	$username = $_POST['username'];
	$password = $_POST['password'];
	$result = mysql_query("Select * From admin where username='$username'",$link);
	if(mysql_num_rows($result)>0)
	{
		$row = mysql_fetch_array($result, MYSQL_BOTH);
		if($password == $row["password"])
		{
			$_SESSION['adminok'] = "ok";
			$_SESSION['username'] = "username";
			$_SESSION['password'] = "password";
			header("Location: admin.php");
		}
		else
		{
			$msg = "Password incorrect";
		}
```

```
        }
        else
        {
                $msg = "Username incorrect";
        }
}
?>



<html>
<head>
<meta http-equiv="Content-Language" content="en-us">
<meta http-equiv="Content-Type" content="text/html; charset=gb2312">
<title>VR Hypermart Backoffice</title>
<link href="style.css" rel="stylesheet" type="text/css">
</head>
<body bgcolor="#C0C0C0" >
<div align="center">
<table border="0" width="100%" cellspacing="0" cellpadding="0" id="table100" height
="100%" >
<tbody>
<tr>
<td vAlign=center align=middle>

<table border="0" width="345" cellspacing="0" cellpadding="0" id="table1"
background="images/login.gif" height="315" >
        <tr>
                <td width="345" valign="top" style="border: 2px solid #FFFFFF" >
                <table border="0" width="100%" cellspacing="0" cellpadding="0" id="table2" >
                        <tr>
                                <td width="97" height="129">  </td>
                                <td width="258" height="129">  </td>
                        </tr>
                        <tr>
                                <td width="97">  </td>
                        <td valign="top"><form name="form1" method="post" action="">
                                <table border="0" width="100%" cellspacing="0" cellpadding="0"
id="table3">
                        <tr>
                        <td height="23"><span class ="arial12bold"><font color
="#FFFFFF">User Name : </font></span></td>
                        </tr>
```

```
                <tr>
                <td height="22">
                <font size="2" face="Arial">
                <input name="username" type="text" id="username">
                </font></td>
                </tr><tr>
                <td>  </td>
                </tr>
                <tr>
                <td height="22"><span class ="arial12bold"><font color
="#FFFFFF">Password :</font></span></td>
                </tr>  <tr>
                <td>
                    <font size="2" face="Arial">
                    <input name="password" type="password" id="password">
                    </font></td>
                </tr>
                <tr>
                <td height="26">  </td>
                </tr>
                <tr>
                <td>
                <table border="0" width="100%" cellspacing="0" cellpadding="0"
id="table4" height="29">
                <tr>
                    <td width="69">
                        <p align="right">
          </td>
    <td width="74"><div align="right">  <input type="submit" name="Submit"
value="Submit"></div></td>
                            <td width="117">  </td>
                                </tr>
                            </table>
                            </td>
                        </tr>
                    </table>
                    </form>
                    </td>
                </tr>
            </table>
            </td>
        </tr>
    </table>
    </td></tr></tbody></table>
```

```
</div>

</body>

</html>
```

VRML

For the VRML, it is using to generate the virtual reality environment.

Below are the few sentences of VRML code.

```
#VRML V2.0 utf8
WorldInfo
{
 info "Author: Room Arranger, www.roomarranger.com"
 title "Room Arranger 3D scene"
}
DEF WALK_NAV NavigationInfo
{
 avatarSize [ 0.15, 1.6, 0.5 ]
 headlight FALSE
 type [ "ANY", "WALK" ]
}
DEF FLY_NAV NavigationInfo
{
 avatarSize [ 0.15, 1.6, 0.5 ]
 headlight FALSE
 type [ "FLY", "ANY" ]
}
Background
{
 groundAngle 1.57
 groundColor [ 0.7 0.8 0, 0.3 0.5 0 ]
 skyAngle [ 1.5, 1.57 ]
 skyColor [ 0 0 1, 0.6 0.8 1, 1 1 1 ]
}
Transform
{
 children
 [
```

```
    Shape
    {
     appearance Appearance
     {
      material Material
      {
       diffuseColor 0 0 0
       emissiveColor 0.3 0.5 0
      }
     }
     geometry Box
     {
      size 200 0.2 200
     }
    }
  ]
  translation 0 -0.12 0
}
DEF VP1 Viewpoint
{
  orientation 0 1 0 0.17
  position 29 1.6 37.5
  description "Start"
}
DEF VP2 Viewpoint
{
  orientation 0 1 0 -1.22
  position 27 1.6 32
  description "counter"
}
DEF VP3 Viewpoint
{
  orientation 0 1 0 -3.14
  position 13.5 1.6 24.2
  description "cashier"
}
DEF VP4 Viewpoint
{
  orientation 0 1 0 -1.22
  position 27 1.6 25.5
  description "telephone"
}
PointLight
{
```

```
  ambientIntensity 0.15
  intensity 0.28
  location -2 19.05 -2
}
PointLight
{
  ambientIntensity 0.15
  intensity 0.28
  location -2 19.05 42
}
PointLight
{
  ambientIntensity 0.15
  intensity 0.28
  location 39 19.05 42
}
PointLight
{
  ambientIntensity 0.15
  intensity 0.28
  location 39 19.05 -2
}
Transform
{
 children
 [
   OpenDoorSub2
   {
    appearance Appearance
    {
     texture ImageTexture
     {
      url "textures/door1.jpg"
      repeatS FALSE
      repeatT FALSE
     }
    }
    OpenRot 0 1 0 0
    ClosedRot -1.57
    scale 1 1.95 0.03
   }
 ]
 rotation 0 1 0 0
 translation 7.47 0 0
```

```
}
Transform
{
 children
 [
  OpenDoorSub2
  {
   appearance Appearance
   {
    texture ImageTexture
    {
     url "textures/door1.jpg"
     repeatS FALSE
     repeatT FALSE
    }
   }
   OpenRot 0 1 0 0
   ClosedRot 1.57
   scale 1 1.95 0.03
  }
 ]
 rotation 0 1 0 -3.1416
 translation 9.47 0 0
}
```

7.2.4 Scripting Language and CSS(Cascading Style Sheets)

CSS (Cascading Style Sheets) is also used to gain better control of the interface design.

```
.arial10 {
        font-family: Arial;
        font-size: 10px;
}
A:link { text-decoration: none; color: #000000; }
A:visited {text-decoration: none; color: #000000; }
A:hover {text-decoration: none; color: #DE2910; }
A:active {text-decoration: none; color: #000000; }

.arial16 {
        font-family: Arial;
        font-size: 16px;
```

```
        font-weight: bold;
}
.pagebg {
        background-image: url(images/bg.gif);
        background-position: center;
}
.arial11bold {
        font-family: Arial;
        font-size: 11px;
        font-weight: bold;
}

.arial12bold {
        font-family: Arial;
        font-size: 12px;
        font-weight: bold;
}
.arial12{
        font-family: Arial;
        font-size: 12px;
}


.arial11 {
        font-family: Arial;
        font-size: 11px;
}

.arial16bold {
        font-family: Arial;
        font-size: 16px;
        font-weight: bold;
        color: #666666;
}

.arial13 {
        font-family: Arial;
        font-size: 13px;
}
.introbg {
        background-image: url(images/intro_dotbg.gif);
        background-repeat: repeat-y;
        background-position: left top;
}
```

CHAPTER 8 SYSTEM EVALUATION AND CONCLUSION

8.1 Introduction

Evaluation is important phase before deliver to the end user and the ultimate phase of developing the system. Evaluation are related to user environment, attitudes, information priorities and several concerns that need consider carefully before effectiveness can be concluded. At all phases of the system approaches, evaluation is a process that occurs continuously, drawing on a variety of sources and information.

8.2 Problem Encounter and its Solutions

8.2.1 Problem with PHP Coding

PHP was a new application for me to develop a dynamic web page. Here, I start from beginning to learning the PHP and Mysql coding. The entire tutorial and open source was coming from internet. Some of the system PHP coding was modify from the open source. Before I started modify, I had fully understand the coding function. Then the modification can be done easily. The new function was creating according to the system function we had set in the initial stage. Some of the function we require was not able to find in open source. So, I had visit google group to find the solution.

8.2.2 Problem with VRML Coding

For VRML coding, which had been generate from the "Room Arranger" software, it need to do some editing inside the coding to make the VR environment more interactive and also do some scaling of the picture. The scaling picture is the product picture inside the rack. Only one product image was use, but we need so modification on the coding to make the picture can duplicate at the surface of a box. So, the product on the rack was more than one product. The amount of picture duplicate can be changing inside the coding. Beside that, we need editing the coding of VRML in order to add the anchor link to *.php file, to read the detail of product information from the database.

8.3 Evaluation by End User

Virtual Reality Hypermarket was proposed to make the application more interactive and fulfilling the objective of the system. The final stage of system development which is the system testing becomes critical and it needs feedbacks from all respective users in judging the correctness of these functionalities, precise data flow as well as user friendliness of the system's interfaces.

The development of Virtual Reality Hypermarket was conducted with the objective to cover the scope briefly, which means that the whole system was developed quickly to have the overall structure and potential of the system but the system was not refined to show its full efficiency.

The overall feedback from the end users is valuable and Virtual Reality Hypermarket was expected to serve the targeted group well after refining.

8.4 System Strengths

8.4.1 Virtual Navigation

Client was able to navigate the virtual environment by using the device of a computer with mouse and monitor. Inside the VR environment, client can be changing the view point of the environment in order proceed to other department by the interface drop-down list. Client also can view VR movie of the whole VR hypermarket navigation.

8.4.2 Future Integration

Virtual Reality Hypermarket is developed using PHP, which enable better integrity in the future.

8.4.3 Support High Volumes of Users

Virtual Reality Hypermarket is deployed using the latest database from SQL, the MySql 4.1.7, which is the most powerful database in the market. This makes it ready to cope with large amount of user in the future.

8.5 System Constraints and Future Enhancements

This Virtual Reality Hypermarket can functions more efficiency if some refining work had been done. It will increase its usability and reliability. The aspects to be refine and suggestion to enhance the system are state below:

- Strict data type checking

  Check the input of user strictly using JavaScript to maintain the consistency of data stored and avoid error.

- Adding Function of E-commerce

  Client was able to buy the product through online.

- Avatar available

  The availability avatar can make the system more interactive if there is conversation between user and the avatar.

- Virtual Map

  The virtual map available in VR environment, the user can check their location inside the map.

APPENDIX B – USER MANUAL

1.1 Introduction

Virtual Reality Hypermarket is a web base system that can let the client of hypermarket had online virtual tour the hypermarket environment before entering the hypermarket and checking the stock availability of the stock. This manual is a guide to help client visiting the web site in right way in order had fully using the function inside the VR environment.

1.2 Client Section

1.2.1 Main Page

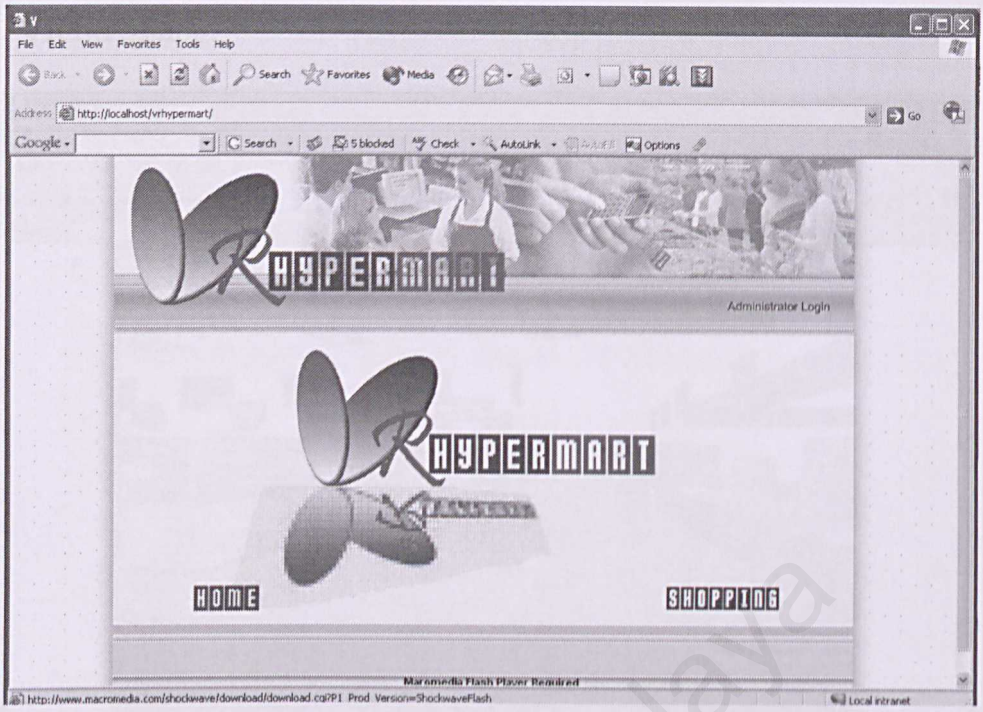
Here is the intro flash, the client can select to:

- Home

  Here is the home page of the web site. From here, user can navigate to other section as well.

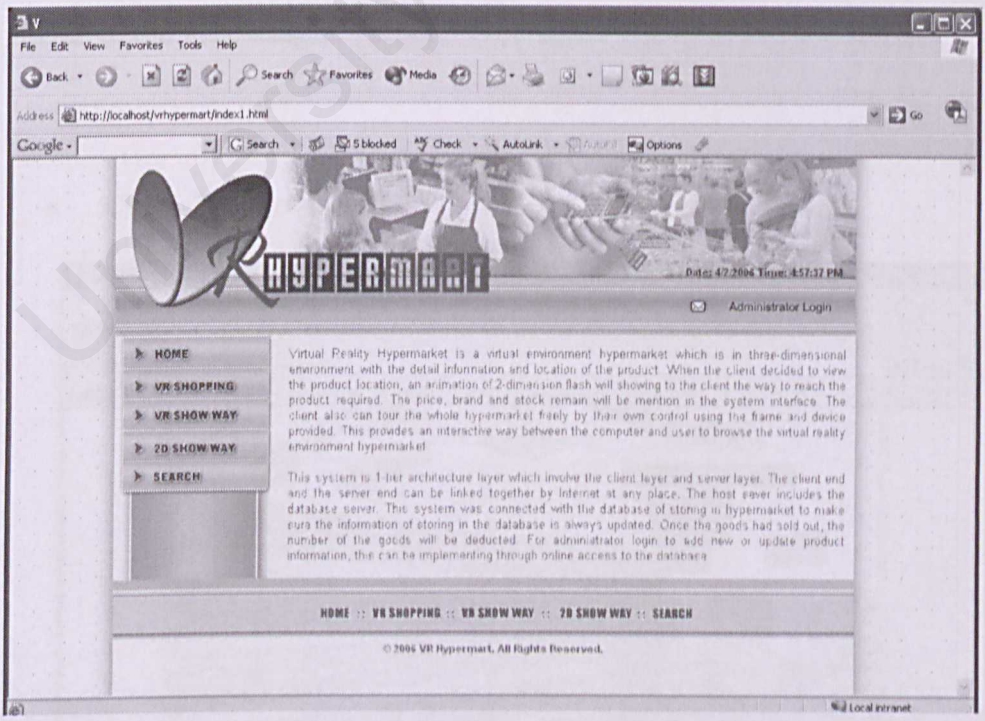
- Shopping

  Client can straight go to VR shopping section.

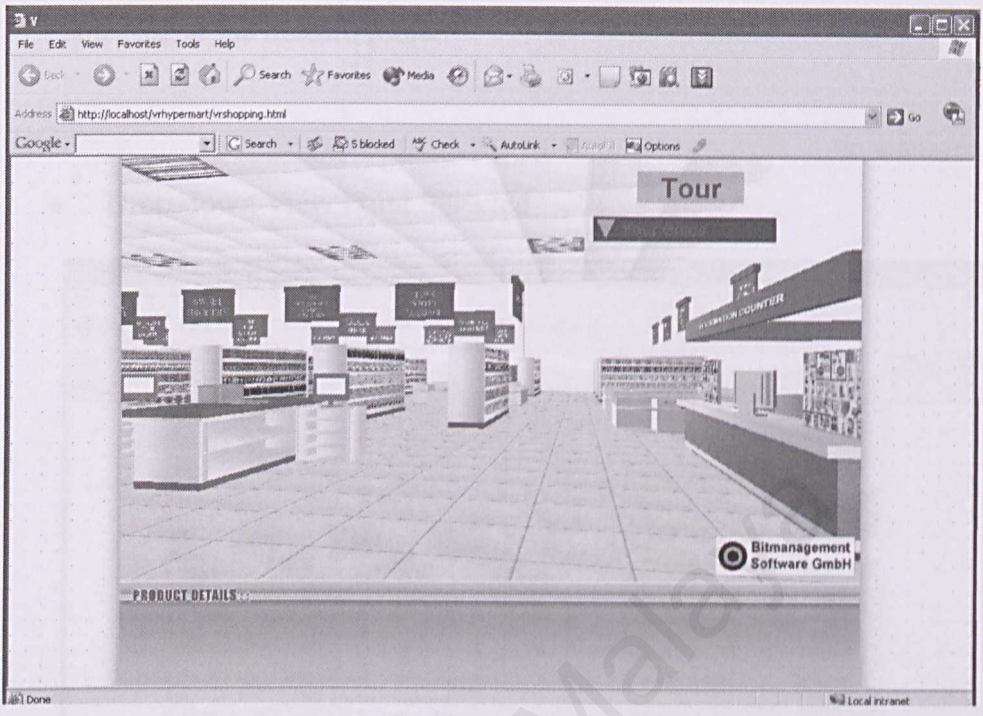


1.2.2 Home Page

Here is a simple introduction about the Virtual Reality Hypermarket.

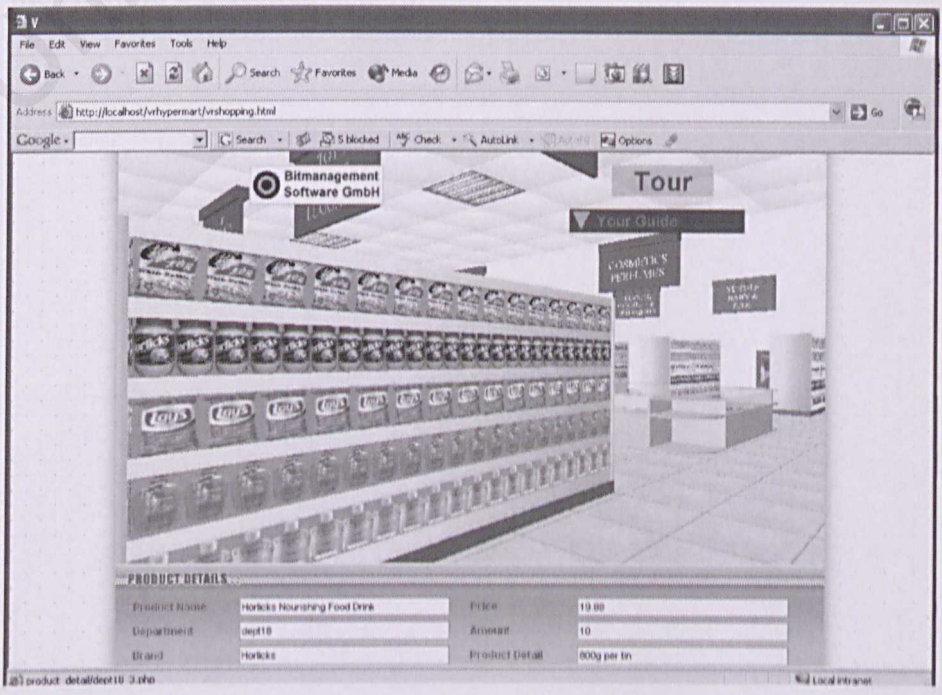


1.2.3 VR Shopping



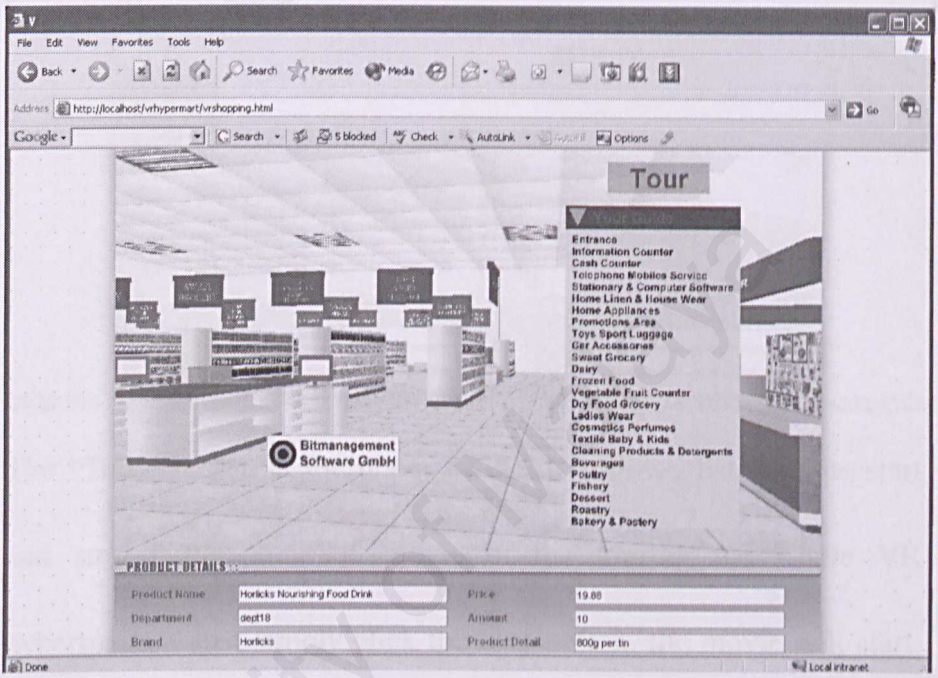
This is the virtual environment of the hypermarket. Here client can tour the environment freely. Here got three functions available which are listed at the following:

- Check Product Detail



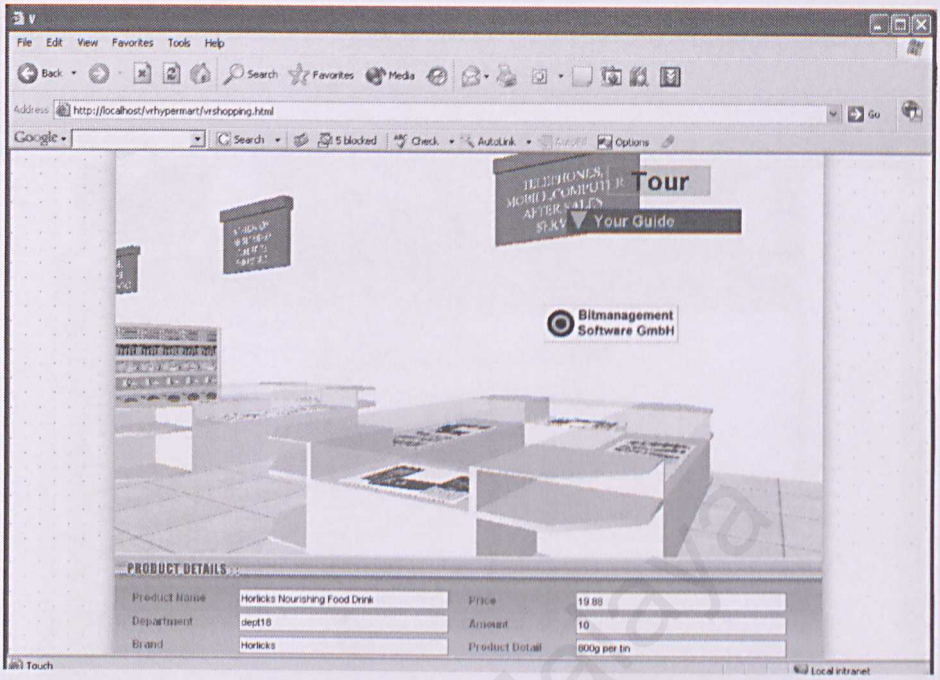
When client click the product image, the product details will be showing at the bottom footer.

- Drop-down View Point Selected



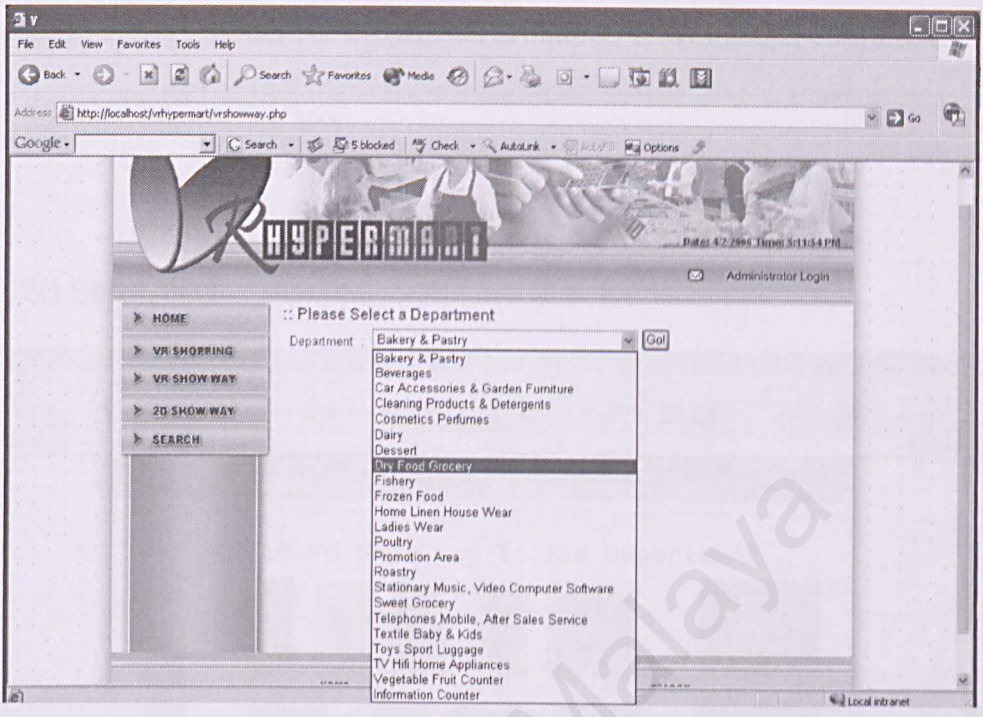
The drop-down list was listed all together 24 department of the view point. The client can select from the list where will had quick bring the client to the desired department.

- VR movie Touring



The "Tour" button at the upper of the drop-down list was the start and stop button for VR movie of the touring the whole VR hypermarket. Just simply click the tour button, the movie will start. When movie was running, click again the "tour" button, the movie will be stop.

1.2.4 VR Show Way

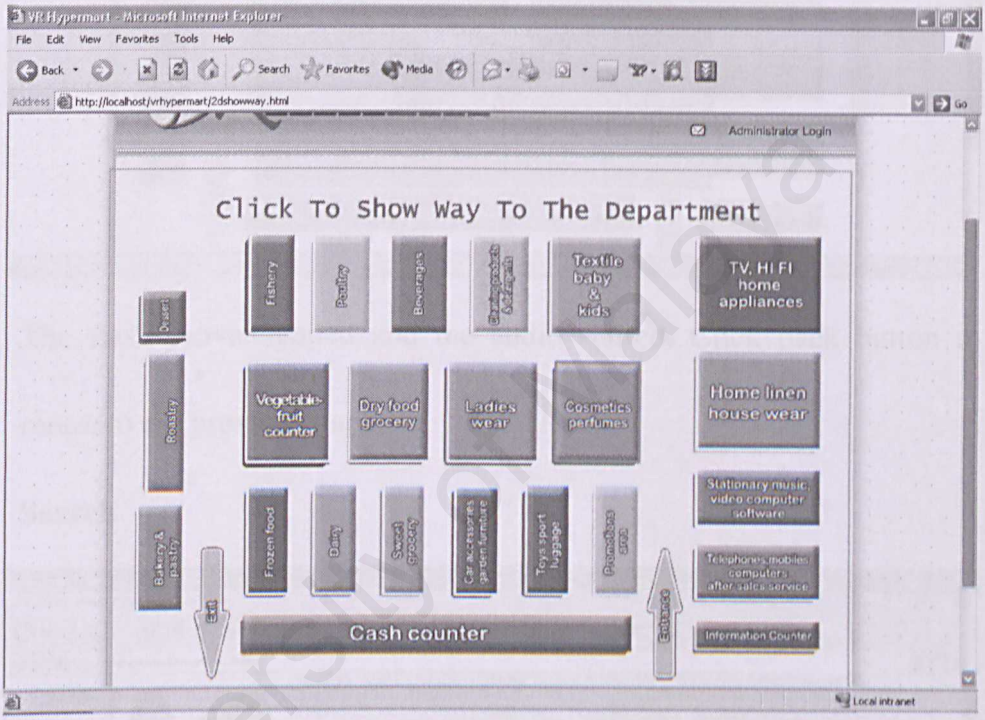


The client can select the desired department from the drop-down list, then click "go" button. The VR movie will be load.

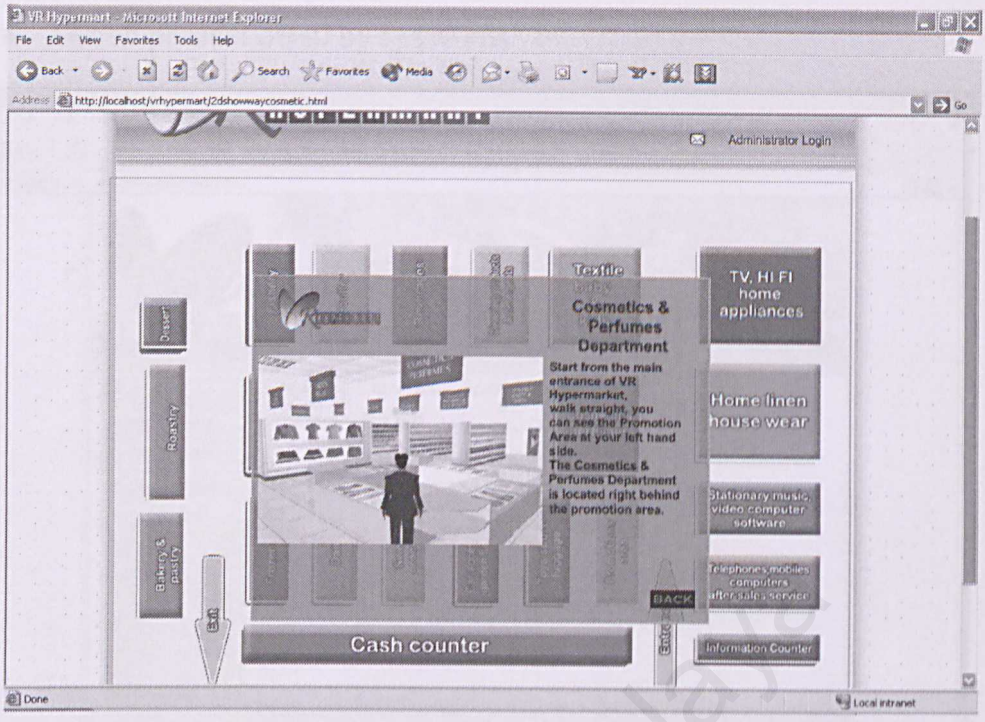
When the VR movie was load, just simply click the "start" button, the

movie will start running. When "start" button click again, the movie will be stop. When the movie start running, it will loops continuously until the client click stop.

1.2.5 2D Show Way

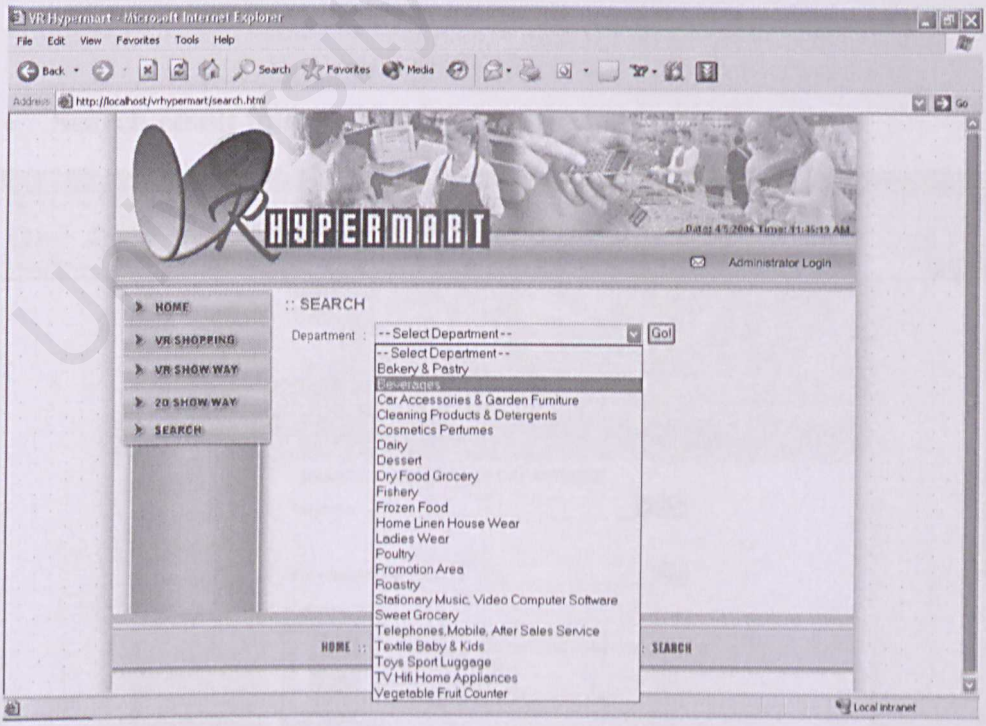


The client can select the desired department from the 2D flash map, and then double click; the flash movie will be loaded.



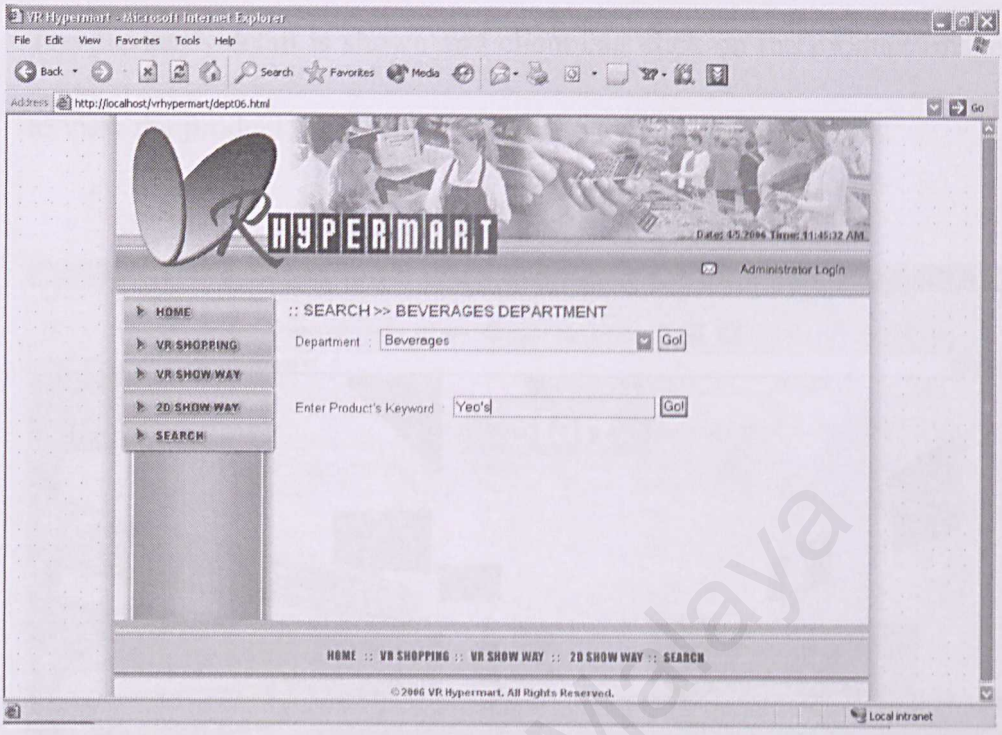
The flash movie loaded and the audio started. Click back button to return to the previous page.

1.2.6 Search



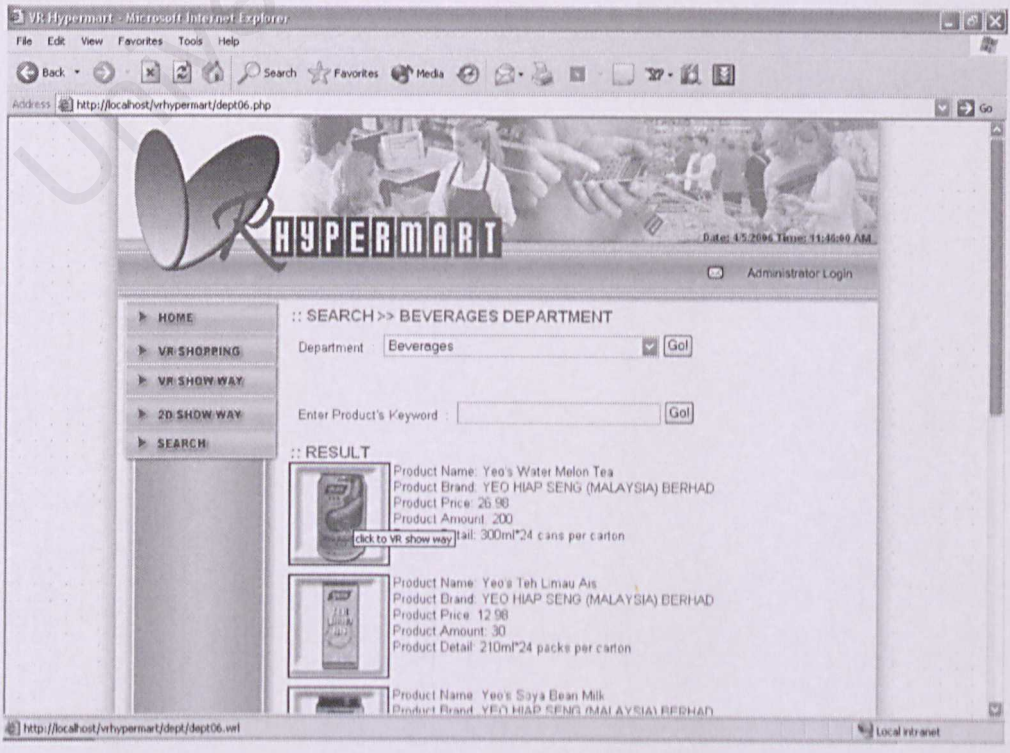
The client can select the desired department from the drop-down list, then click "go" button.

- Search product detail by keywords

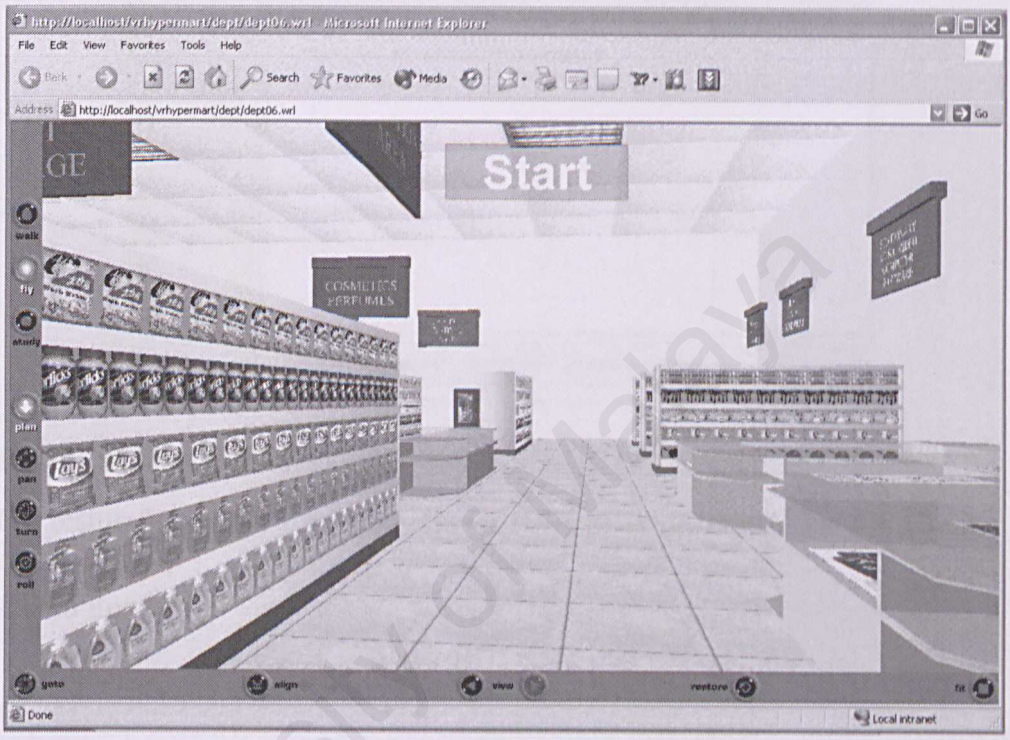


The client can type in the product keywords and click "go" button to load the search result.

- **Search result found**

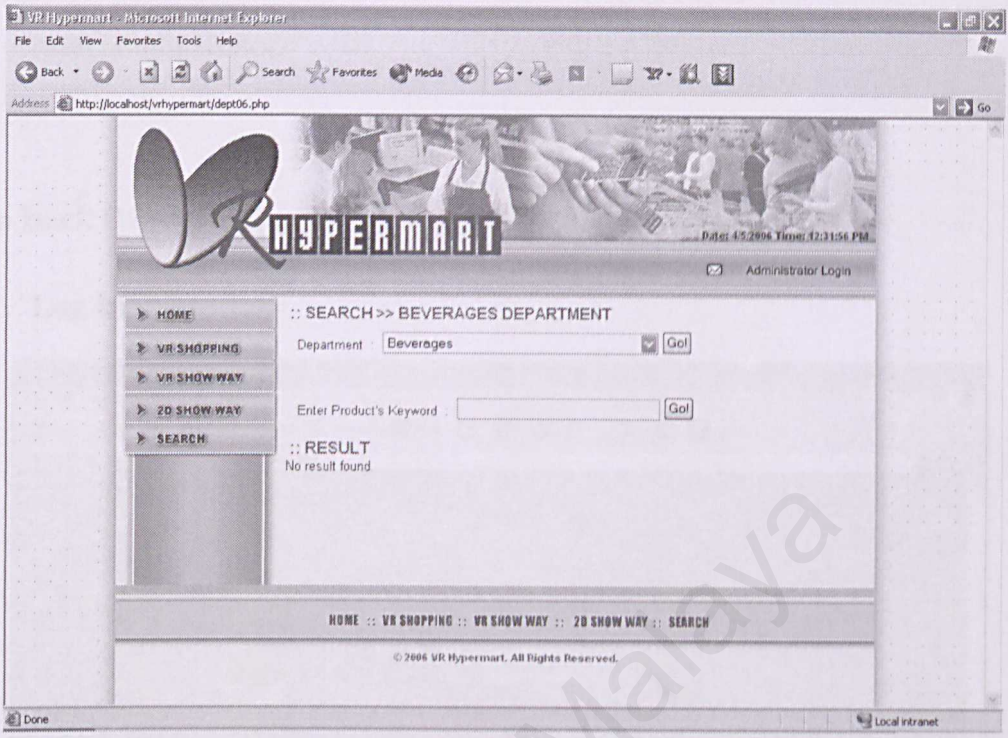


The client can view all the searched result by scrolling down the tab bar. The product's detail is shown and client can click on the product image to view the product location in VR show way in a new windows.



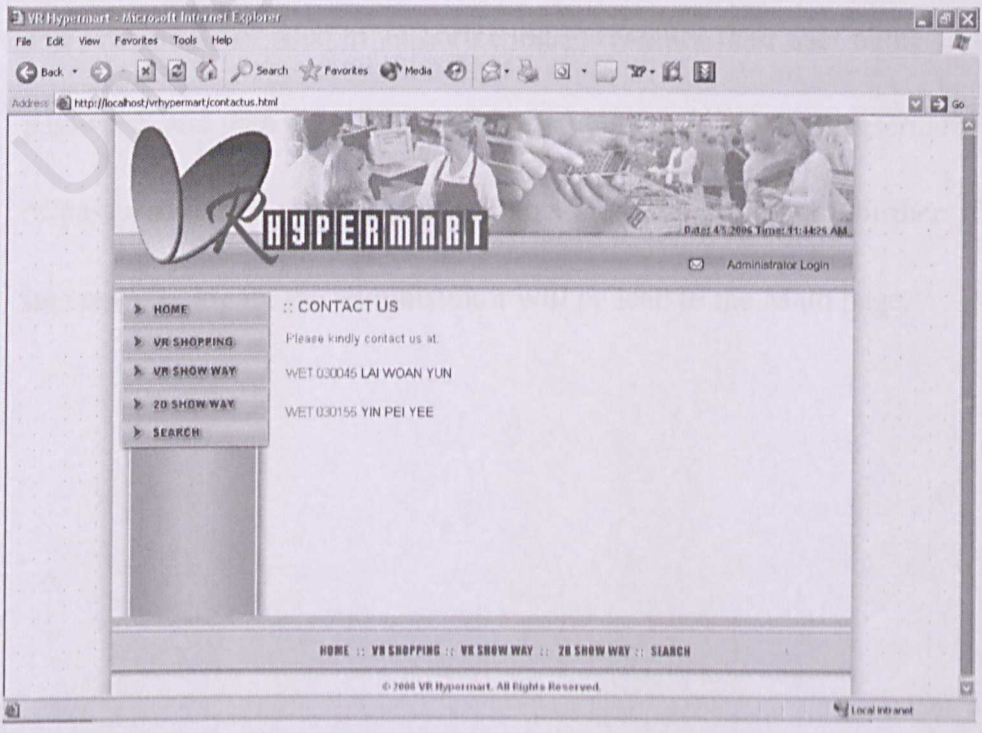
The VR show way loaded after click on the product images.

- **Search result not found**



No result found page will be shown if there is no match for the client search item.

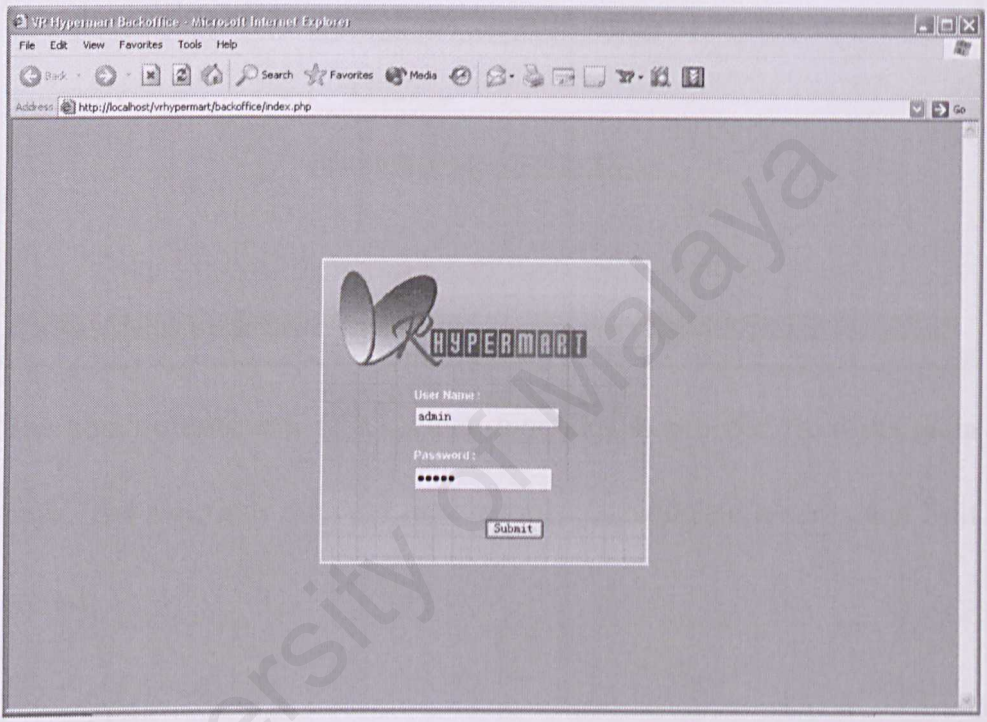
1.2.7 Contact Us



The client can click on the name hyperlink to email to the VR hyper mart administrator.

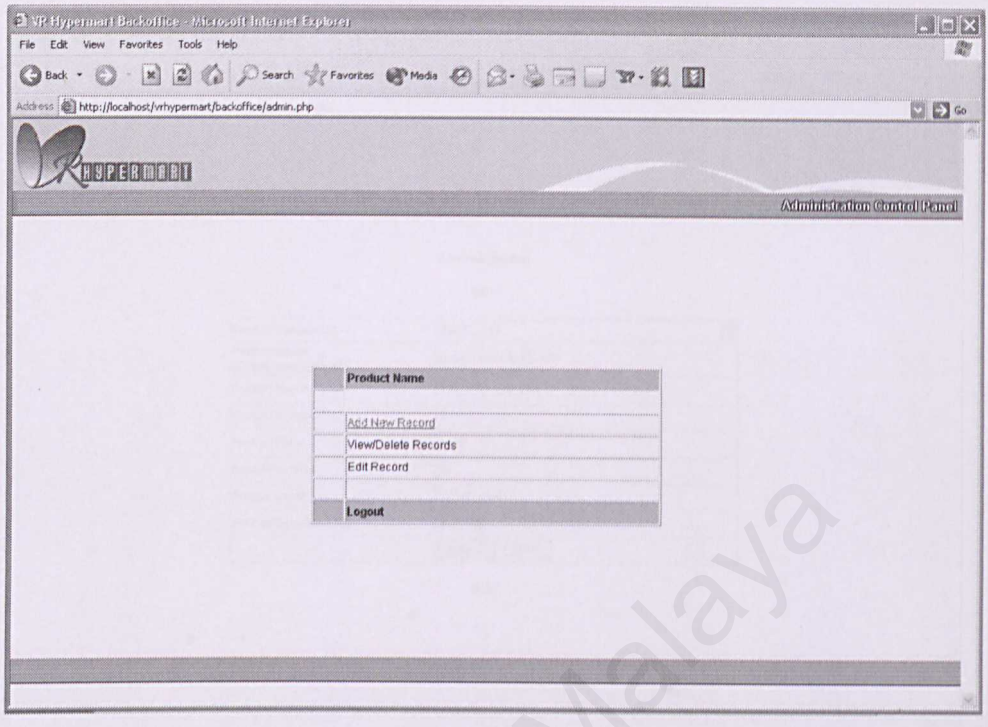
1.3 Admin Back Office Section

1.3.1 Log In



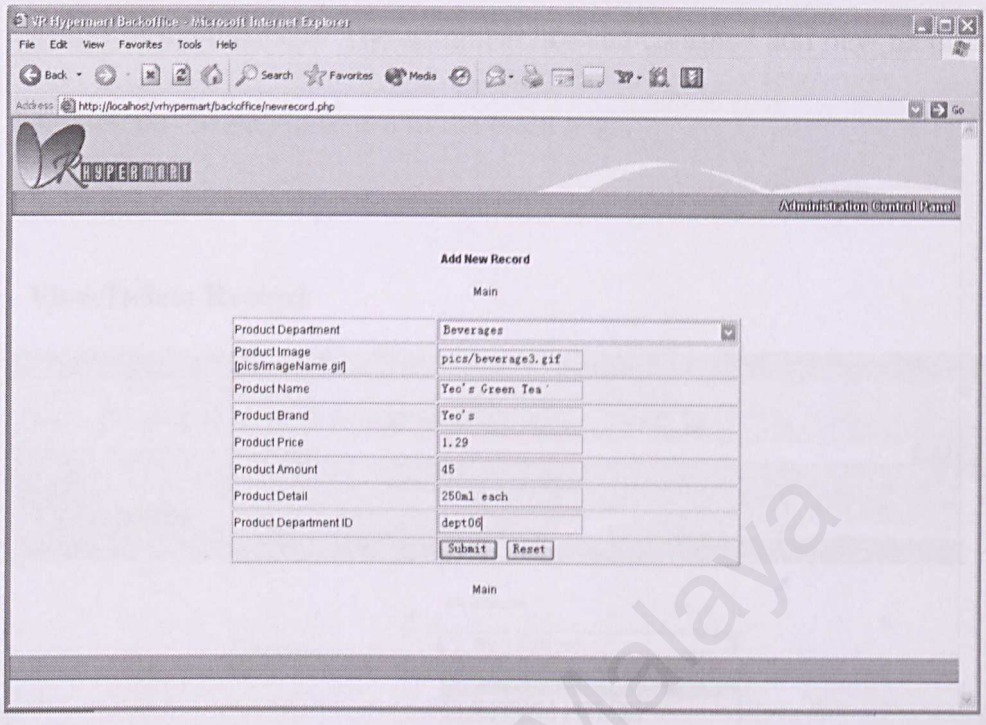
The administrator need to authorize log in by enter their user name and password, and then click the 'submit' button to proceed. If the username or password is not matched, the administrator can not go any further. If successfully log in, the administrator will be lead to the Main page.

1.3.2 Main Page

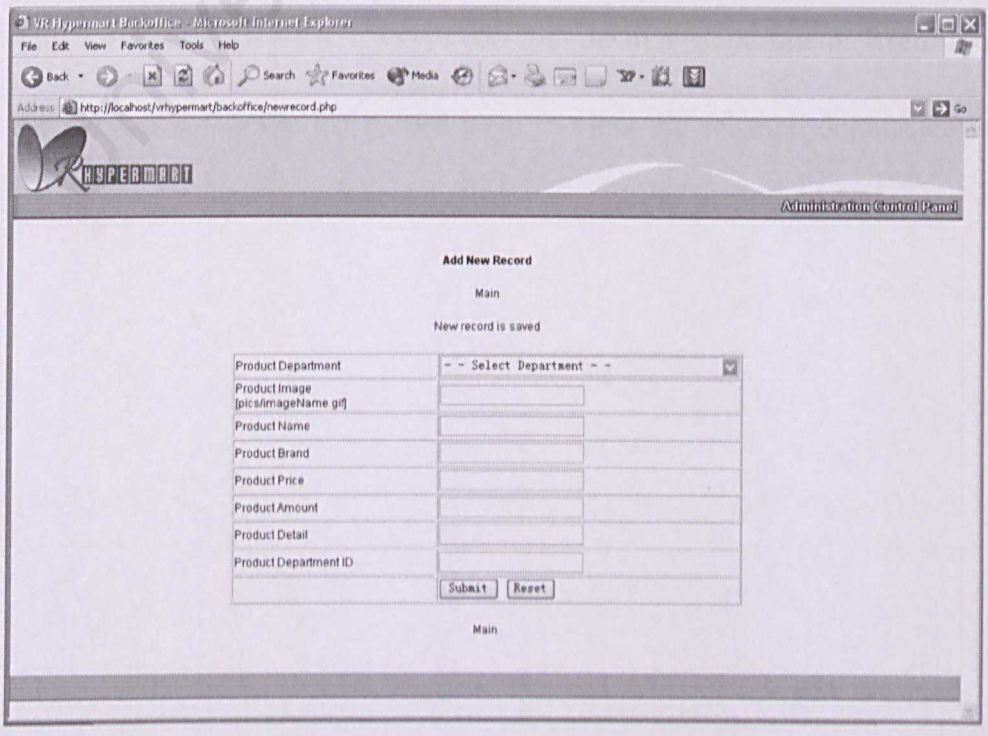


The administrator can select which functions to proceed from the main page. The functions are Add new records, View/delete records and Edit record.

1.3.3 Add New Record

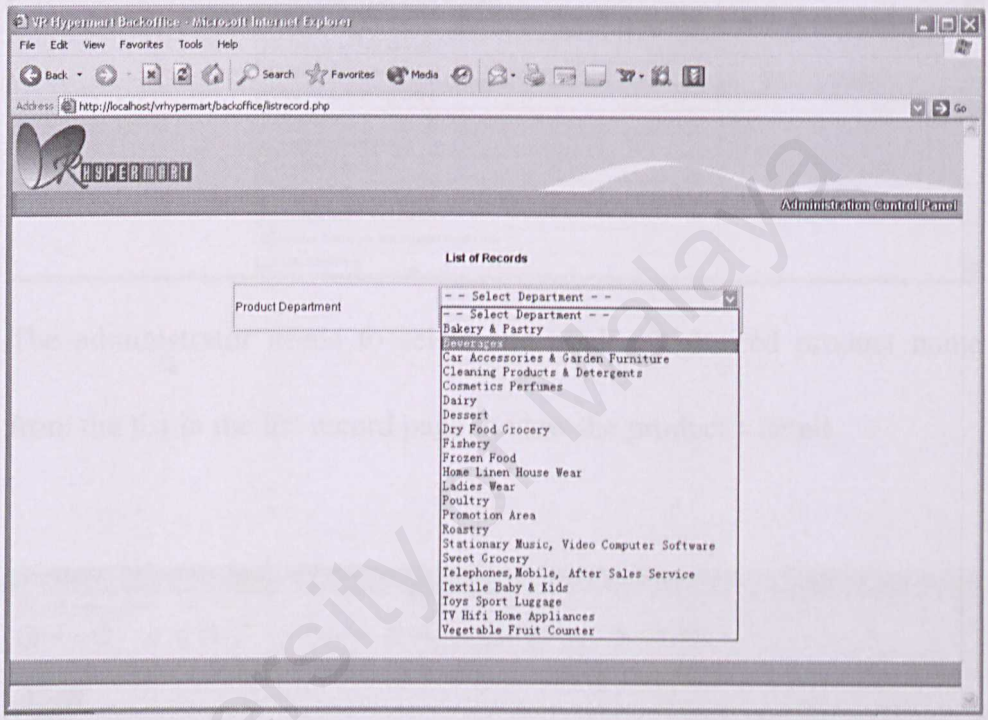


The administrator needs to select the desired department from the drop-down list, next to fill in the product detail. Click on the "Submit" button to add new record to database or "Reset" button to reset the filled details.

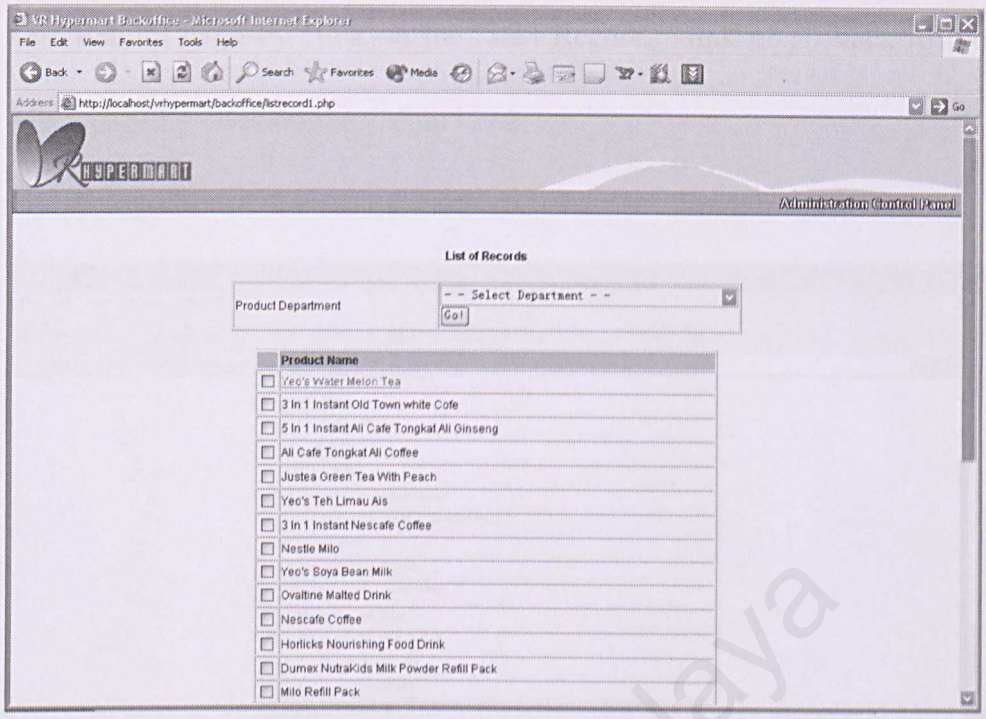


The new record is saved page shown after successfully added new record to the database. The administrator can continue add new records or click on "Main" to return to the main page.

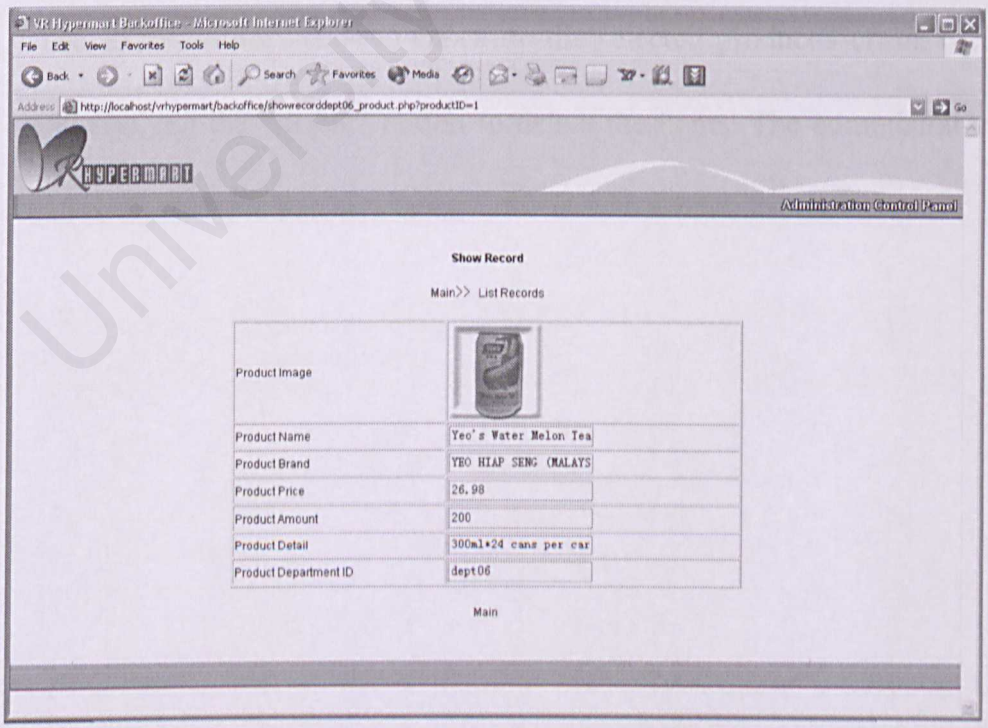
1.3.4 View/Delete Record



The administrator needs to select the desired department from the drop-down list in the list record page to view the selected department's products.

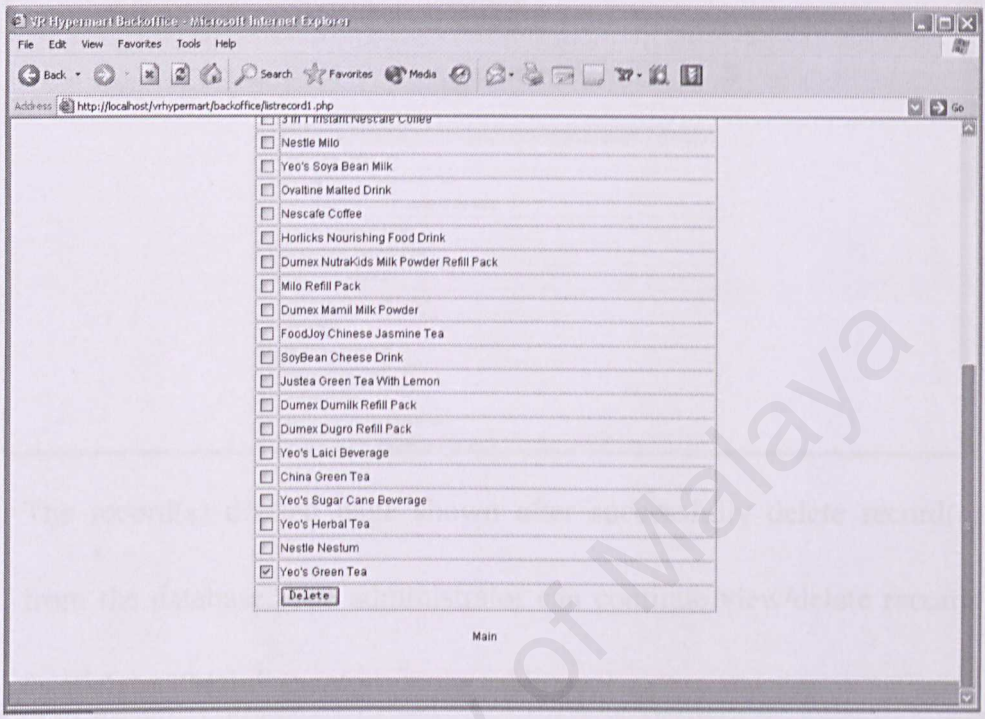


The administrator needs to select and click the desired product name from the list in the list record page to view the product's detail.

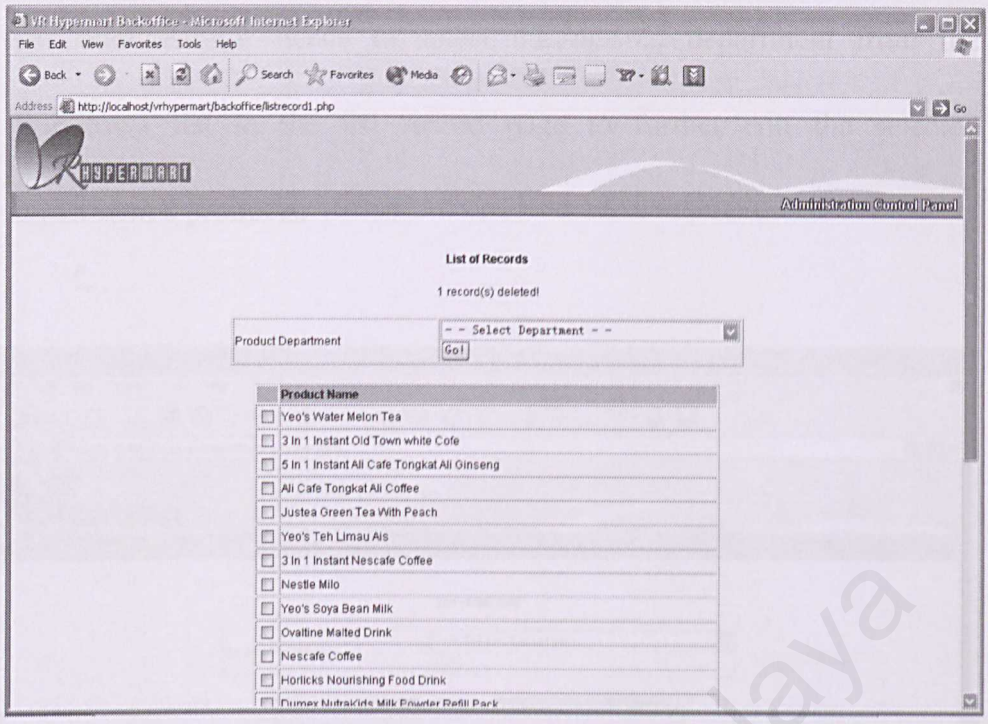


The administrator can to view the product's detail after clicked on the product name in the previous pages. The administrator can go back to the

List Record page by click on the "List Records" link or go back to the Main page by click on the "Main" link.

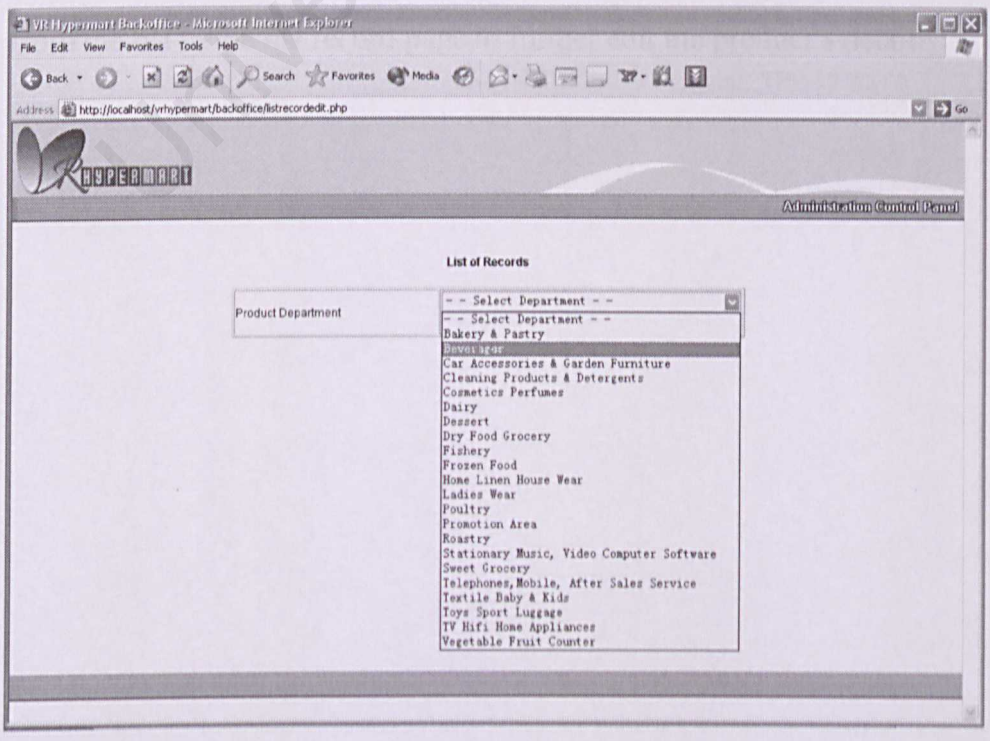


The administrator needs to check on the selected product's check box and clicking the "delete" button to delete the items. The administrator can checked more than one item.

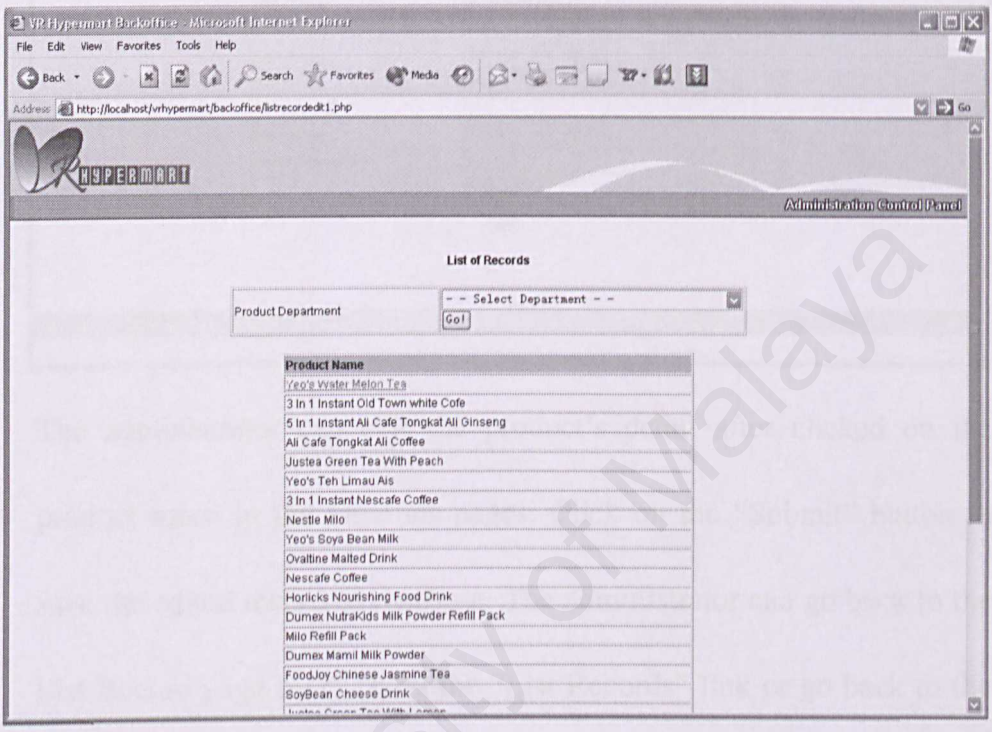


The record(s) deleted page shown after successfully delete record(s) from the database. The administrator can continue view/delete records or click on "Main" to return to the main page.

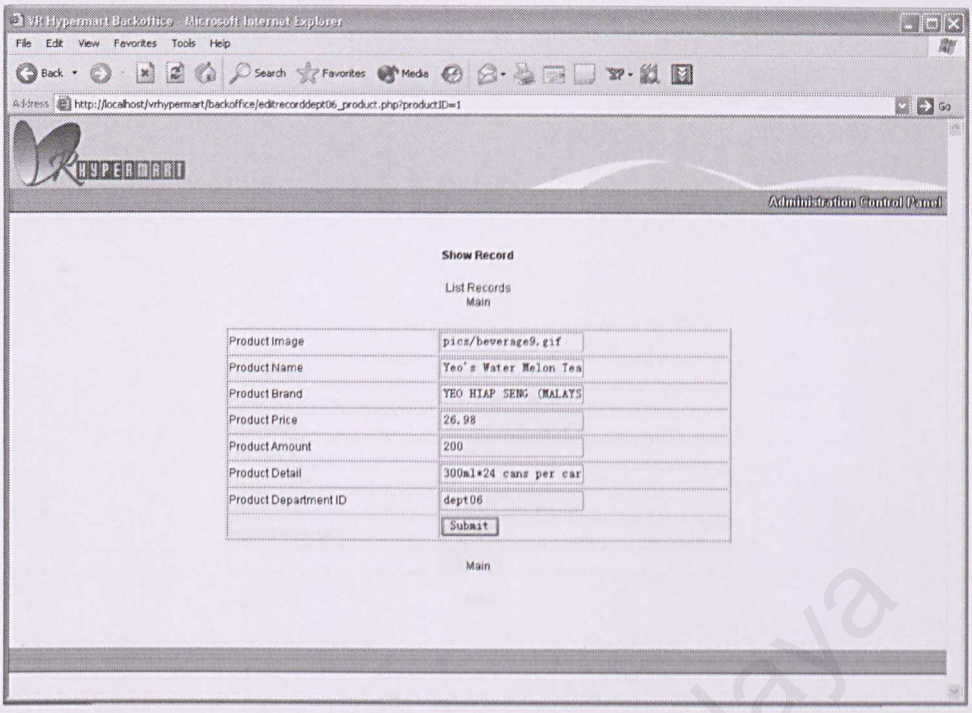
1.3.5 Edit Record



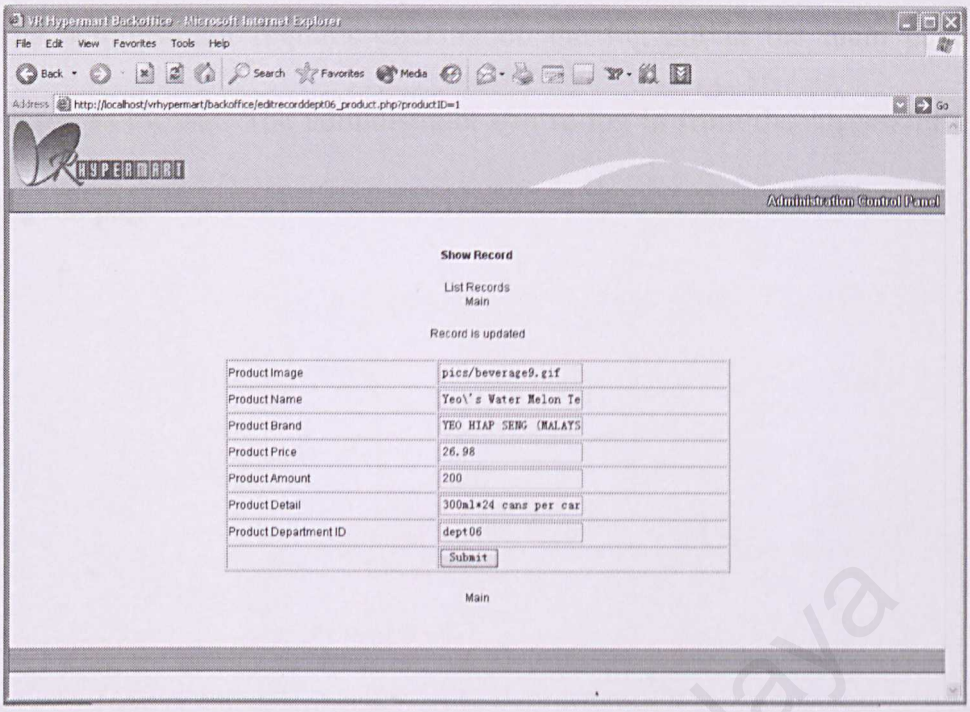
The administrator needs to select the desired department from the drop-down list in the list record page to further edit the selected department's products.



The administrator needs to select and click the desired product name from the list in the list record page to further edit the product's detail.

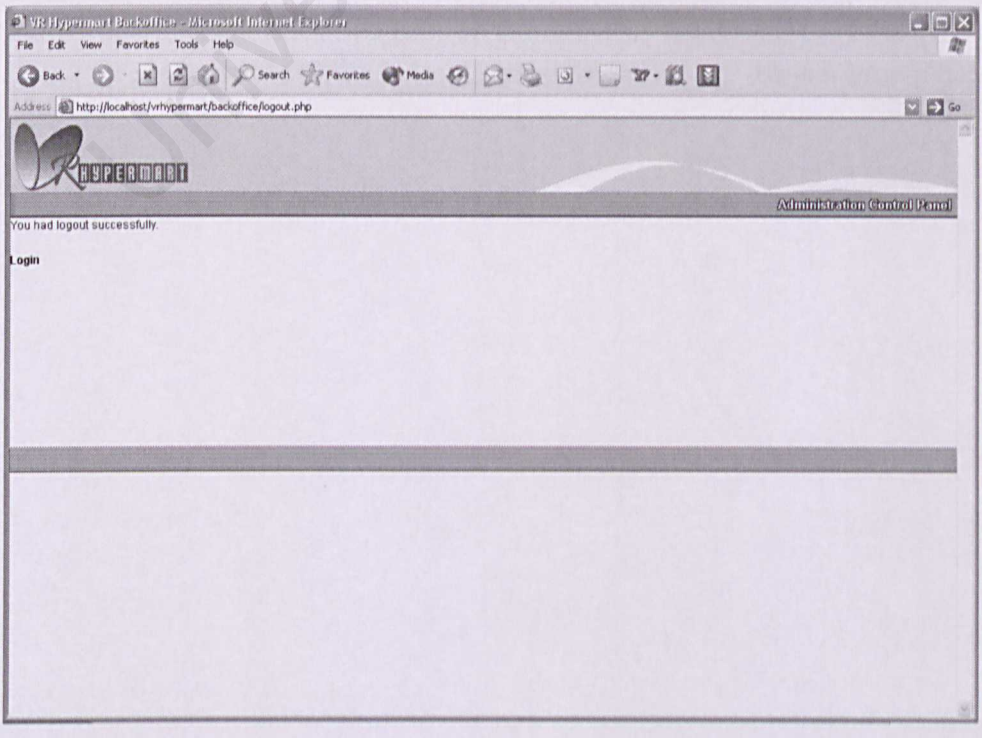


The administrator can edit the product's detail after clicked on the product name in the previous pages. Click on the "Submit" button to save the edited record to database. The administrator can go back to the List Record page by click on the "List Records" link or go back to the Main page by click on the "Main" link.



The record is updates page shown after successfully edit record from the database. The administrator can go back to the List Record page by click on the "List Records" link or go back to the Main page by click on the "Main" link.

1.3.6 Log Out



The administrator requires clicking on the log out in the main page button to log out. The administrator can re-log in from the successfully log out page.

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Mass, Y. & Herzberg, A. (1999). VRCommerce — Electronic Commerce in Virtual Reality. Proceedings of the 1st ACM conference on Electronic commerce, 103-109. Diperolehi July 26, 2005, dari pangkalan data ACM DIGITAL LIBRARY.

[2]http://www.utusan.com.my/utusan/archive.asp?y=2003&dt=1009&pub=utusan_ep ress&sec=economy&pg=ec_01.htm&arc=hive

Five-year freeze on new hypermarkets in three areas from 2004

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[6] http://www.webdevelopersjournal.com/articles/vrml/start1.html

[7] http://en.wikipedia.org/wiki/3D_Studio_Max

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[6] A 3D Virtual Shopping Mall That Has the Intelligent Virtual Purchasing Guider and Cooperative Purchasing Functionalities Zhao, Y.M., Guo, L.J., Wang, X.L. & Pan, Z.G. (2004). A 3D Virtual Shopping Mall That Has the Intelligent Virtual Purchasing Guider and Cooperative Purchasing Functionalities. Computer Supported Cooperative Work in Design, 2, 381-385. Diperolehi August 3, 2005, dari pangkalan data IEEE XPLORE.

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[11] http://en.wikipedia.org/wiki/CGI

[12] VRCommerce — Electronic Commerce in Virtual Reality

[13]http://en.wikipedia.org/wiki/Level_of_Detail

[14] http://en.wikipedia.org/wiki/PHP

[15] http://en.wikipedia.org/wiki/MySQL

[16] http://en.wikipedia.org/wiki/Apache_server

[17] http://en.wikipedia.org/wiki/VRML

[18] http://en.wikipedia.org/wiki/3D_Studio_Max

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